Public Buildings Enhanced Energy Efficiency Program

Investigation Results For
Rochester Community and Technical College

5/17/2012

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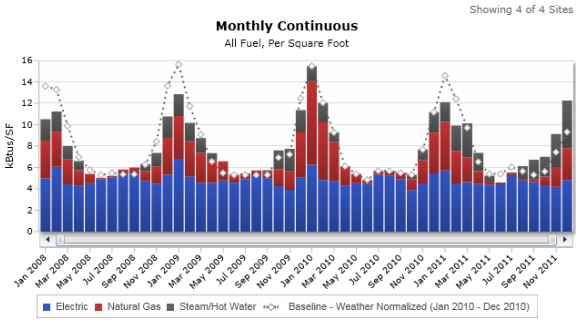
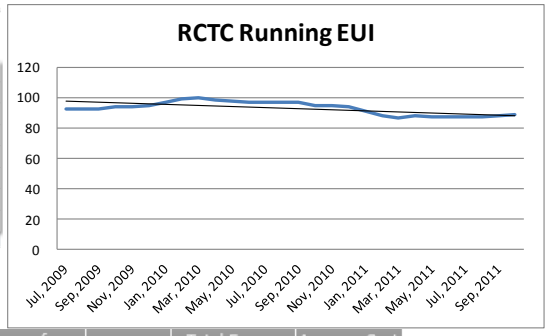
PBEEEP
State Government

Investigation Overview

The goal of a PBEEEP Energy Investigation is to identify energy savings opportunities with a payback of fifteen years or less. Particular emphasis is on finding those opportunities that will generate savings with a relatively fast (1 to 5 years) and certain payback. During the investigation phase the provider conducts a rigorous analysis of the building operations. Through observation, targeted functional testing, and analysis of extensive trend and portable logger data, the RCx Provider identifies deficiencies in the operation of the mechanical equipment, lighting, envelope, and related controls. The investigation of the Rochester Community and Technical College was performed by Ericksen, Ellison & Associates, Inc. This report is the result of that information.

Payback Information and Energy Savings				
Total Project costs (Without Co-funding)			**Project costs with Co-funding**	
Total costs to date including study	$182,937		Total Project Cost	$235,057
Future costs including Implementation , Measurement & Verification	$52,120		Study and Administrative Cost Paid with ARRA Funds	($182,937)
Total Project Cost	$235,057		Utility Co-funding	($0)
			Total costs after co-funding	$52,120
Estimated Annual Total Savings ($)	$52,152		Estimated Annual Total Savings ($)	$52,152
Total Project Payback (years)	4.5		Total Project Payback (years) with co-funding	1.0
Electric Energy Savings	**1.9 %**	**and**	**Natural Gas Savings***	**34.6 %**
(*Heating savings, site has partially switched to district steam)				





Year	Days	SF	Total kBtu	Normalized Baseline kBtu	Change from Baseline kBtu	% Change	Total Energy Cost $	Average Cost Rate $ /kBtu
2008	366	826,527	72,931,824	82,103,594	-9,171,770	-11%	$944,186.44	$0.01
2009	365	826,527	78,189,981	79,624,679	-1,434,699	-2%	$961,771.07	$0.01
2010	365	826,527	77,816,073	77,816,073	0	0%	$1,502,397.66	$0.02
2011	365	826,527	79,424,151	77,192,488	2,231,664	3%	$1,574,441.83	$0.02

Rochester Community and Technical College energy consumption decreased 12% over the period of the study

STATE OF MINNESOTA B3 BENCHMARKING

Summary Tables

Facility Name	Rochester Community and Technical College
Location	Main Campus, Sports Center, and Stadium: 851 30th Ave SE Rochester, MN 55904 Heintz Center: 1926 College View Road SE Rochester, MN 55904
Facility Manager	Shayn Jensen
Number of Buildings Investigated	21 (in 4 building groups)
Interior Square Footage Investigated	819,194
PBEEEP Provider	Ericksen Ellison & Associates, Inc.
Study Period	Summer 2010 – Winter 2012
Annual Energy Cost	$1,574,442 (2011)
Utility Company	Rochester Public Utilities (Electric) Minnesota Energy Resources (Natural Gas) Olmstead County Waste to Energy (Steam)
Site Energy Use Index (EUI)	101 kBtu/sq. ft (at start of study from B3) 89 kBtu/sq. ft (at end of study from B3)
Benchmark EUI (from B3)	142 kBtu/sq. ft

Buildings Investigated:

The four buildings listed below totaling 819,194 interior square feet at RCTC were investigated.

Building Name	Area (Square Feet)	EUI (kbtu/ft^2)	Year Built
Main Campus	415,124	93	1972
Heintz Center	200,850	83	1968
Field House – Sports Center	115,220	93	2002
Stadium/Dome	88,000	129	2009

The main campus and Field House-Sports Center share electric metering

Mechanical Equipment Summary Table			
3			BAS Honeywell (new); Barber Colman; Andover
Main	Heintz	Sports	
34	6	8	Air Handlers
>125	16	44	VAV Boxes
	9		Roof Top Units
6	1	2	Chillers
4			Cooling Towers
	2	2	Boilers
100			PTAC Units

Implementation Information			
Estimated Annual Total Savings ($)			$63,285
Total Estimated Implementation Cost ($)			$83,785
GHG Avoided in U.S Tons (CO2e) (assuming standard electric generation in Minnesota, not WAPA's actual delivery)			405
Electric Energy Savings (kWh) (2011 Usage 6,522,600 kWh)*	27 % Savings		1,788,179
Electric Demand Savings (Peak kW) (2010 Peak demand was 1,631 kW)*	13.5 % Savings		219
Natural Gas Savings (Therms) (2010 Usage 33,874 Therms)	1.8 % Savings		598
Statistics			
Number of Measures identified			16
Number of Measures with payback < 3 years			7
Screening Start Date	03/21/2010	Screening End Date	05/19/2010
Investigation Start Date	08/01/2011	Investigation End Date	2/15/2012
Final Report	4/30/2012	Report Presentation	

*Prorated based on building area which is 18.5% of total campus

Rochester Community and Technical College Cost Information			
Phase		**To date**	**Estimated**
Screening		$8,240	
Investigation [Provider]		$156,920	
Investigation [CEE]		$17,777	$1,000
Implementation			$46,120
Implementation [CEE]			$3,000
Measurement & Verification			$2,000
Total		$182,937	$52,120

Co-funding Summary	
Study and Administrative Cost	$182,937
ARRA Funds for 25% of Lighting ($)	$0
Total Co-funding ($)	$182,937

RCTC Overview

The energy investigation of four main building groups at Rochester Community and Technical College identified 7.5% of energy savings in these buildings with measures that payback in less than 15 years and do not adversely affect occupant comfort. The energy savings opportunities identified at Rochester Community and Technical College include optimizing the schedules of HVAC equipment so they do not run when the building is not occupied, installing low flow aerators in faucets and showers, and adjusting set points to best utilize economizers. The total cost of implementing all the measures is $53,366.

Implementing all these measures can save the facility approximately $52,152 a year, paying back the cost of implementation by energy savings in 1.0 years. Because the study was paid for with ARRA funds the payback is based only on the implementation costs (the study cost is excluded).

During the period of the PBEEEP investigation energy use at Rochester Community and Technical College decreased by about 12% compared to the year prior to the study. It is now 37% below the benchmark value according to the Minnesota Benchmarking and Beyond database (B3).

The site is divided into four groups of buildings:

The Main Campus is comprised of fourteen attached buildings and four detached buildings totaling 418,457 interior square feet. Many of the buildings are served by the chilled water plant and steam boiler plant located in Science and Technology Hall. However, six of the Main Campus buildings have electric heat and three have DX cooling.

The Heintz Center is comprised of five attached buildings that are divided into three wings (A, B, and C) and seven detached buildings totaling 200,850 interior square feet. The Heintz Center has its own chilled water plant and multiple DX units for cooling. The buildings use steam that is purchased from the Olmsted County Waste-to-Energy Facility.

The Sports Center is a stand-alone detached building totaling 115,220 interior square feet. It has its own chilled water and hot water plant, although plans are in place to use steam from the waste-to-energy facility instead of the boilers. A steam-to-hot water converter would be installed so that the buildings would continue to be heated with hot water. It is served by the Main Campus electric meter.

The Stadium is a stand-alone detached building totaling 88,000 interior square feet. It is heated by direct-fire gas burners that bring in 100% outside air.

There are three automation systems, although the College is systematically upgrading the older controls to a single system (Honeywell). The buildings were all constructed between 1968 and 2009. There have been major renovations to the mechanical systems since the buildings were constructed and there have also been major use changes within the buildings. There have been some major mechanical upgrades during the history of the facility but largely the equipment is original to the buildings.

Findings Summary

Site: Rochester CTC

Eco #	Building	Investigation Finding	Total Cost	Savings	Payback	Co-Funding	Payback Co-Funding	GHG
10	Main Campus	Equipment Schedules - Hours of operation	$2,000	$17,209	0.12	$0	0.12	145
3	Field House- Sports Center	Existing Occupied Schedules do not match occupied times	$1,750	$5,945	0.29	$0	0.29	48
4	Heintz Center Main Bldg	Economizer setpoints are too low.	$750	$2,442	0.31	$0	0.31	40
5	Main Campus	Economizer setpoints are too low.	$750	$2,376	0.32	$0	0.32	39
1	Main Campus	Equipment Schedules - Hours of operation	$4,000	$10,774	0.37	$0	0.37	90
4	Field House- Sports Center	Economizer setpoints are too low.	$750	$1,686	0.44	$0	0.44	27
2	Heintz Center Main Bldg	Existing Occupied Schedules do not match occupied times	$2,000	$3,478	0.58	$0	0.58	29
5	Field House- Sports Center	Facility does not utilize low flow shower heads. Thus they use more hot water than necessary.	$3,950	$2,828	1.40	$0	1.40	21
3	Main Campus	Facility does not utilize low flow lavatories for restrooms. Thus they use more hot water than neces	$4,410	$1,754	2.51	$0	2.51	13
3	Heintz Center Main Bldg	Facility does not utilize low flow lavatories for restrooms. Thus they use more hot water than neces	$2,210	$655	3.37	$0	3.37	5
8	Main Campus	CHWS Temp does not reset and is maintained at a constant supply temp.	$5,050	$750	6.73	$0	6.73	12
1	Field House- Sports Center	Facility does not utilize low flow lavatories for restrooms. Thus they use more hot water than neces	$3,200	$453	7.07	$0	7.07	3
9	Main Campus	Data center cooling units are constant volume fans. Liebert makes a retrofit kit for these units to	$15,300	$1,802	8.49	$0	8.49	29
		Total for Findings with Payback 3 years or less:	**$20,360**	**$48,493**	**0.42**	**$0**	**0.42**	**453**
		Total for all Findings:	**$46,120**	**$52,152**	**0.88**	**$0**	**0.88**	**502**

PBEEEP was made possible with funding from the U.S. Department of Energy and the MN Department of Commerce.

Finding Type Number	Finding Type	Relevant Findings	Looked for, Not found	Not relevant
a.1 (1)	Time of Day enabling is excessive	3	1	
a.2 (2)	Equipment is enabled regardless of need, or such enabling is excessive		2	
a.3 (3)	Lighting is on more hours than necessary.	3	1	
a.4 (4)	OTHER_Equipment Scheduling/Enabling		4	
b.1 (5)	Economizer Operation – Inadequate Free Cooling (Damper failed in	3	1	
b.2 (6)	Over-Ventilation – Outside air damper failed in an open position. Minimum		4	
b.3 (7)	OTHER_Economizer/OA Loads		4	
c.1 (8)	Simultaneous Heating and Cooling is present and excessive		4	
c.2 (9)	Sensor/Thermostat needs calibration, relocation/shielding, and/or	3	1	
c.3 (10)	Controls "hunt" and/or need Loop Tuning or separation of		4	
c.4 (11)	OTHER_Controls		4	
d.1 (12)	Daylighting controls or occupancy sensors need optimization.	2	2	
d.2 (13)	Zone setpoint setup/setback are not implemented or are sub-optimal.	1	3	
d.3 (14)	Fan Speed Doesn't Vary Sufficiently	1	3	
d.4 (15)	Pump Speed Doesn't Vary Sufficiently		4	
d.5 (16)	VAV Box Minimum Flow Setpoint is higher than necessary		4	
d.6 (17)	Other_Controls (Setpoint Changes)		4	

e.1 (18)	HW Supply Temperature Reset is not implemented or is sub-optimal		4	
e.2 (19)	CHW Supply Temperature Reset is not implemented or is sub-optimal	2	2	
e.3 (20)	Supply Air Temperature Reset is not implemented or is sub-optimal	1	2	
e.4 ( )	Supply Duct Static Pressure Reset is not implemented or is sub-optimal	3	1	
e.5 (21)	Condenser Water Temperature Reset is not implemented or is sub-optimal		2	2
e.6 (22)	Other_Controls (Reset Schedules)		4	
f.1 (23)	Daylighting Control needs optimization—Spaces are Over-Lit	1	3	
f.2 (24)	Pump Discharge Throttled		4	
f.3 (25)	Over-Pumping		4	
f.4 (26)	Equipment is oversized for load.		4	
f.5 (27)	OTHER_Equipment Efficiency/Load Reduction		4	
g.1 (28)	VFD Retrofit - Fans	2	2	
g.2 (29)	VFD Retrofit - Pumps		4	
g.3 (30)	VFD Retrofit - Motors (process)		4	
g.4 (31)	OTHER_VFD		4	
h.1 (32)	Retrofit - Motors		2	2
h.2 (33)	Retrofit - Chillers		4	
h.3 (34)	Retrofit - Air Conditioners (Air Handling Units, Packaged Unitary Equipment)		4	
h.4 (35)	Retrofit - Boilers		4	
h.5 (36)	Retrofit - Packaged Gas fired heating		4	
h.6 (37)	Retrofit - Heat Pumps		2	2
h.7 (38)	Retrofit - Equipment (custom)		4	

h.8 (39)	Retrofit - Pumping distribution method		4	
h.9 (40)	Retrofit - Energy/Heat Recovery		4	
h.10 (41)	Retrofit - System (custom)		4	
h.11 (42)	Retrofit - Efficient Lighting	1	3	
h.12 (43)	Retrofit - Building Envelope		4	
h.13 (44)	Retrofit - Alternative Energy		4	
h.14 (45)	OTHER_Retrofit	3	1	
i.1 (46)	Differed Maintenance from Recommended/Standard	1	3	
i.2 (47)	Impurity/Contamination		4	
i.3 ( )	Leaky/Stuck Damper	1	3	
i.4 ( )	Leaky/Stuck Valve		4	
i.5 (48)	OTHER_Maintenance		4	
j.1 (49)	OTHER		4	

Findings Glossary: Findings Examples

a.1 (1)	**Time of Day enabling is excessive**
	• HVAC running when building is unoccupied. Equipment schedule doesn't follow building occupancy • Optimum start-stop is not implemented • Controls in hand
a.2 (2)	**Equipment is enabled regardless of need, or such enabling is excessive**
	• Fan runs at 2" static pressure. Lowering pressure to 1.8" does not create comfort problem and the flow is per design. • Supply air temperature and pressure reset: cooling and heating
a.3 (3)	**Lighting is on more hours than necessary**
	• Lighting is on at night when the building is unoccupied • Photocells could be used to control exterior lighting • Lighting controls not calibrated/adjusted properly
a.4 (4)	**OTHER Equipment Scheduling and Enabling**
	• Please contact PBEEEP Project Engineer for approval
b.1 (5)	**Economizer Operation – Inadequate Free Cooling**
	• Economizer is locked out whenever mechanical cooling is enabled (non-integrated economizer) • Economizer linkage is broken • Economizer setpoints could be optimized • Plywood used as the outdoor air control • Damper failed in minimum or closed position
b.2 (6)	**Over-Ventilation**
	• Demand-based ventilation control has been disabled • Outside air damper failed in an open position • Minimum outside air fraction not set to design specifications or occupancy
b.3 (7)	**OTHER Economizer/Outside Air Loads**
	• Please contact PBEEEP Project Engineer for approval
c.1 (8)	**Simultaneous Heating and Cooling is present and excessive**
	• For a given zone, CHW and HW systems are unnecessarily on and running simultaneously • Different setpoints are used for two systems serving a common zone
c.2 (9)	**Sensor / Thermostat needs calibration, relocation / shielding, and/or replacement**
	• OAT temperature is reading 5 degrees high, resulting in loss of useful economizer operation • Zone sensors need to be relocated after tenant improvements • OAT sensor reads high in sunlight
c.3 (10)	**Controls "hunt" / need Loop Tuning or separation of heating/cooling setpoints**
	• CHW valve cycles open and closed • System needs loop tuning – it is cycling between heating and cooling
c.4 (11)	**OTHER Controls**
	• Please contact PBEEEP Project Engineer for approval
d.1 (12)	**Daylighting controls or occupancy sensors need optimization**
	• Existing controls are not functioning or overridden • Light sensors improperly placed or out of calibration
d.2 (13)	**Zone setpoint setup / setback are not implemented or are sub-optimal**
	• The cooling setpoint is 74 ºF 24 hours per day
d.3 (14)	**Fan Speed Doesn't Vary Sufficiently**
	• Fan runs at 2" static pressure. Lowering pressure to 1.8" does not create comfort problem and the flow is per design. • Supply air temperature and pressure reset: cooling and heating

d.4 (15)	**Pump Speed Doesn't Vary Sufficiently**
	• Pump runs at 15 PSI on peak day. Lowering pressure to 12 does not create comfort problem and the flow is per design. Low ΔT across the chiller during low load conditions.
d.5 (16)	**VAV Box Minimum Flow Setpoint is higher than necessary**
	• Boxes universally set at 40%, regardless of occupancy. Most boxes can have setpoints lowered and still meet minimum airflow requirements.
d.6 (17)	**Other Controls (Setpoint Changes)**
	• Please contact PBEEEP Project Engineer for approval
e.1 (18)	**HW Supply Temperature Reset is not implemented or is sub-optimal**
	• HW supply temperature is a constant 180 ºF. It should be reset based on demand, or decreased by a reset schedule as OAT increases. • DHW Setpoints are constant 24 hours per day
e.2 (19)	**CHW Supply Temperature Reset is not implemented or is sub-optimal**
	• CHW supply temperature is a constant 42 ºF. It could be reset, based on demand or ambient temperature.
e.3 (20)	**Supply Air Temperature Reset is not implemented or is sub-optimal**
	• The SAT is constant at 55 ºF. It could be reset to minimize reheat and maximize economizer cooling. The reset should ideally be based on demand (e.g., looking at zone box damper positions), but could also be reset based on OAT.
e.4 ( )	**Supply Duct Static Pressure Reset is not implemented or is suboptimal**
	• The Duct Static Pressure (DSP) is constant at 1.5" wc. It could be reset to minimize fan energy. The reset should ideally be based on demand (e.g. looking at zone box damper positions), but could also be reset based on OAT.
e.5 (21)	**Condenser Water Temperature Reset is not implemented or is sub-optimal**
	• CW temperature is constant leaving the tower at 85 ºF. The temperature should be reduced to minimize the total energy use of the chiller and tower. It may be worthwhile to reset based on load and ambient conditions.
e.6 (22)	**Other Controls (Reset Schedules)**
	• Please contact PBEEEP Project Engineer for approval
f.1 (23)	**Lighting system needs optimization - Spaces are overlit**
	• Lighting exceeds ASHRAE or IES standard levels for specific space types or tasks
f.2 (24)	**Pump Discharge Throttled**
	• The discharge valve for the CHW pump is 30% open. The valve should be opened and the impeller size reduced to provide the proper flow without throttling.
f.3 (25)	**Over-Pumping**
	• Only one CHW pump runs when one chiller is running. However, due to the reduced pressure drop in the common piping, the pump is providing much greater flow than needed.
f.4 (26)	**Equipment is oversized for load**
	• The equipment cycles unnecessarily • The peak load is much less than the installed equipment capacity

f.5 (27)	**OTHER Equipment Efficiency/Load Reduction**
	• Please contact PBEEEP Project Engineer for approval
g.1 (28)	**VFD Retrofit Fans**
	• Fan serves variable flow system, but does not have a VFD. • VFD is in override mode, and was found to be not modulating.
g.2 (29)	**VFD Retrofit - Pumps**
	• 3-way valves are used to maintain constant flow during low load periods. • Only one CHW pumps runs when one chiller is running. However, due to the reduced pressure drop in the common piping, the pump is providing much greater flow than needed.
g.3 (30)	**VFD Retrofit - Motors (process)**
	• Motor is constant speed and uses a variable pitch sheave to obtain speed control.
g.4 (31)	**OTHER VFD**
	• Please contact PBEEEP Project Engineer for approval
h.1 (32)	**Retrofit - Motors**
	• Efficiency of installed motor is much lower than efficiency of currently available motors
h.2 (33)	**Retrofit - Chillers**
	• Efficiency of installed chiller is much lower than efficiency of currently available chillers
h.3 (34)	**Retrofit - Air Conditioners (Air Handling Units, Packaged Unitary Equipment)**
	• Efficiency of installed air conditioner is much lower than efficiency of currently available air conditioners
h.4 (35)	**Retrofit - Boilers**
	• Efficiency of installed boiler is much lower than efficiency of currently available boilers
h.5 (36)	**Retrofit - Packaged Gas-fired heating**
	• Efficiency of installed heaters is much lower than efficiency of currently available heaters
h.6 (37)	**Retrofit - Heat Pumps**
	• Efficiency of installed heat pump is much lower than efficiency of currently available heat pumps
h.7 (38)	**Retrofit - Equipment (custom)**
	• Efficiency of installed equipment is much lower than efficiency of currently available equipment
h.8 (39)	**Retrofit - Pumping distribution method**
	• Current pumping distribution system is inefficient, and could be optimized. • Pump distribution loop can be converted from primary to primary-secondary)
h.9 (40)	**Retrofit - Energy / Heat Recovery**
	• Energy is not recouped from the exhaust air. • Identification of equipment with higher effectiveness than the current equipment.
h.10 (41)	**Retrofit - System (custom)**
	• Efficiency of installed system is much lower than efficiency of another type of system
h.11 (42)	**Retrofit - Efficient lighting**
	• Efficiency of installed lamps, ballasts or fixtures are much lower than efficiency of currently available lamps, ballasts or fixtures.

h.12 (43)	**Retrofit - Building Envelope**
	• Insulation is missing or insufficient • Window glazing is inadequate • Too much air leakage into / out of the building • Mechanical systems operate during unoccupied periods in extreme weather
h.13 (44)	**Retrofit - Alternative Energy**
	• Alternative energy strategies, such as passive/active solar, wind, ground sheltered construction or other alternative, can be incorporated into the building design
h.14 (45)	**OTHER Retrofit**
	• Please contact PBEEEP Project Engineer for approval
i.1 (46)	**Differed Maintenance from Recommended/Standard**
	• Differed maintenance that results in sub-optimal energy performance. • Examples: Scale buildup on heat exchanger, broken linkages to control actuator missing equipment components, etc.
i.2 (47)	**Impurity/Contamination**
	• Impurities or contamination of operating fluids that result in sub-optimal performance. Examples include lack of chemical treatment to hot/cold water systems that result in elevated levels of TDS which affect energy efficiency.
i.3 ( )	**Leaky/Stuck Damper**
	• The outside or return air damper on an AHU is leaking or is not modulating causing the energy use go up because of additional load to the central heating and/or cooling plant.
i.4 ( )	**Leaky/Stuck Valve**
	• The heating or cooling coil valve on an AHU is leaking or is not modulating causing the energy use go up because of additional load to the central heating and/or cooling plant.
i.5 (48)	**OTHER Maintenance**
	• Please contact PBEEEP Project Engineer for approval
j.1 (49)	**OTHER**
	• Please contact PBEEEP Project Engineer for approval

Findings Summary

Building: Main Campus
Site: Rochester CTC

Eco #	Investigation Finding	Total Cost	Savings	Payback	Co-Funding	Payback Co-Funding	GHG
10	Equipment Schedules - Hours of operation	$2,000	$17,209	0.12	$0	0.12	145
5	Economizer setpoints are too low.	$750	$2,376	0.32	$0	0.32	39
1	Equipment Schedules - Hours of operation	$4,000	$10,774	0.37	$0	0.37	90
3	Facility does not utilize low flow lavatories for restrooms. Thus they use more hot water than neces	$4,410	$1,754	2.51	$0	2.51	13
8	CHWS Temp does not reset and is maintained at a constant supply temp.	$5,050	$750	6.73	$0	6.73	12
9	Data center cooling units are constant volume fans. Liebert makes a retrofit kit for these units to	$15,300	$1,802	8.49	$0	8.49	29
	Total for Findings with Payback 3 years or less:	**$11,160**	**$32,113**	**0.35**	**$0**	**0.35**	**287**
	Total for all Findings:	**$31,510**	**$34,665**	**0.91**	**$0**	**0.91**	**328**

PBEEEP was made possible with funding from the U.S. Department of Energy and the MN Department of Commerce.

Findings Details

PBEEEP State Government

Building: Main Campus

FWB Number:	10201	Eco Number:	1
Site:	Rochester CTC	Date/Time Created:	4/30/2012

Investigation Finding:	Equipment Schedules - Hours of operation	Date Identified:	8/9/2010
Description of Finding:	11 of the AHU's need occupancy schedules or need them redefined in the HONEYWELL BMS system. The systems that have been defined are primarily in the Heintz and Sports Centers from 6:00am to 10:00pm. All other AHU's are on 24/7.		
Equipment or System(s):	AHU with heating and cooling	Finding Category:	Equipment Scheduling and Enabling
Finding Type:	Equipment is enabled regardless of need, or such enabling is excessive		

Implementer:	In House Staff	Benefits:	Energy will be saved by turning off fans, closing outdoor air dampers and allowing temperatures to vary. Maintenance costs will be lowered from less wear and tear on the equipment.
Baseline Documentation Method:	Screen captures of schedules and trending of discharge air temperature along with fan enable trends.		
Measure:	Occupancy Schedules will be created in the BMS for all AHU'S and RTU'S and programmed depending on each building's actual usage.		
Recommendation for Implementation:	HONEYWELL system: New schedules added for each AHU and on/off times entered. Equipment affected is AHU A1, CC S1C, CC S3C, CC S4C, CC S5C, CC S6C, EA S1, HS AHU 1, HS AHU 2, HT A1, HT A2, HT A4.		
Evidence of Implementation Method:	Screen captures of completed schedules and trending of fan status and SFVFD for each air handler. Trend data every 15 min for 2 weeks. Schedules should correspond to proposed schedules "Operating Hours.xls" Also trend DAT, DAT setpoint, MAT, RAT, Zone setback setpoint (as applicable), and OAT.		

Annual Electric Savings (kWh):	24,961	Annual Natural Gas Savings (therms):	12,482
Estimated Annual kWh Savings ($):	$1,313	Estimated Annual Natural Gas Savings ($):	$9,461
Contractor Cost ($):	$2,000		
PBEEEP Provider Cost for Implementation Assistance ($):	$2,000		
Total Estimated Implementation Cost ($):	$4,000		

Estimated Annual Total Savings ($):	$10,774	Utility Co-Funding for kWh ($):	$0
Initial Simple Payback (years):	0.37	Utility Co-Funding for kW ($):	$0
Simple Payback w/ Utility Co-Funding (years):	0.37	Utility Co-Funding for therms ($):	$0
GHG Avoided in U.S. Tons (C02e):	90	Utility Co-Funding - Estimated Total ($):	$0

Current Project as Percentage of Total project			
Percent Savings (Costs basis)	20.7%	Percent of Implementation Costs:	8.7%

Findings Details

PBEEEP State Government

Building: Main Campus

FWB Number:	10201	Eco Number:	3
Site:	Rochester CTC	Date/Time Created:	4/30/2012

Investigation Finding:	Facility does not utilize low flow lavatories for restrooms. Thus they use more hot water than neces	Date Identified:	6/19/2011
Description of Finding:	Facility does not utilize low flow lavatories for restrooms. Thus they use more hot water than necessary.		
Equipment or System(s):	Other	Finding Category:	Retrofits
Finding Type:	Other Retrofit		

Implementer:	In House Staff	Benefits:	Reducing the flow rates in the lavatories will reduce the hot water usage at the building. This will save energy by reducing the amount of water that needs to be heated.
Baseline Documentation Method:	The existing aerators are standard 2.2 GPM aerators. This was combined with calculated usage information to determine the existing hot water usage.		
Measure:	Replace aerators in lavatories with 1.0 GPM flow aerators.		
Recommendation for Implementation:	The maintenance staff shall replace the flow control aerator in each lavatory with an aerator that allows a maximum flow of 1.0 GPM. The faucets are in the public restrooms of each building. HS=8, ST=14, GL=8, CF=8, HT=4, CC=12, PH=4, MH=4 Lavs.		
Evidence of Implementation Method:	Verification of Implementation shall require: Visual inspection of the affected lavatories to verify that the aerators have been changed to low flow versions. Physically tested with a bucket and timer.		

Annual Natural Gas Savings (therms):	2,314	Contractor Cost ($):	$3,410
Estimated Annual Natural Gas Savings ($):	$1,754	PBEEEP Provider Cost for Implementation Assistance ($):	$1,000
		Total Estimated Implementation Cost ($):	$4,410

Estimated Annual Total Savings ($):	$1,754	Utility Co-Funding for kWh ($):	$0
Initial Simple Payback (years):	2.51	Utility Co-Funding for kW ($):	$0
Simple Payback w/ Utility Co-Funding (years):	2.51	Utility Co-Funding for therms ($):	$0
GHG Avoided in U.S. Tons (C02e):	13	Utility Co-Funding - Estimated Total ($):	$0

Current Project as Percentage of Total project			
Percent Savings (Costs basis)	3.4%	Percent of Implementation Costs:	9.6%

PBEEEP was made possible with funding from the U.S. Department of Energy and the MN Department of Commerce.

Findings Details

PBEEEP State Government

Building: Main Campus

FWB Number:	10201	Eco Number:	5
Site:	Rochester CTC	Date/Time Created:	4/30/2012

Investigation Finding:	Economizer setpoints are too low.	Date Identified:	9/15/2010
Description of Finding:	The High temp limit of the economizers are set too low. Enabling them to economize to a higher setpoint will maximize the hours per year in economizer mode. Most setpoints are currently at 55 or 65 F.		
Equipment or System(s):	AHU with heating and cooling	Finding Category:	Economizer/Outside Air Loads
Finding Type:	Economizer Operation - Inadequate Free Cooling (Damper failed in minimum or closed position, economizer setpoints not optimized)		

Implementer:	In-house Staff	Benefits:	The Economizer will be able to operate up to a higher temperature, reducing the need for mechanical cooling.
Baseline Documentation Method:	Screenshots of equipment setpoints and trend logs of RAT, MAT, SAT, OAT and space temperatures show OA% and economizer operation.		
Measure:	Raise the economizer high limit setpoint in the BMS to 72 degrees.		
Recommendation for Implementation:	The staff shall reprogram the economizer high limit setpoints for all air handling units. The setpoints in the BMS shall be 72 F. Equipment affected is AHU S1B, AHU S2B, AHU 7, AHU 8, AHU A1, AHU S1C, AHU S3C, AHU S4C, AHU S5C, AHU S6C, AHU L1, AHU L2, HS AHU 1, HT A1, HT A2, HT A4, AHU 2LL, ST AHU 3, ST AHU 4, AHU 12, SS AHU 9, SS AHU 10, SS AHU 11, SH AHU 12.		
Evidence of Implementation Method:	Screenshots of equipment setpoints and trend logs of RAT, MAT, SAT, OAT and space temperatures show OA% and economizer operation. Trend data every 15 minutes for 2 weeks in the swing season when temperatures are around 55-75.		

Annual Electric Savings (kWh):	45,161	Contractor Cost ($):	$0
Estimated Annual kWh Savings ($):	$2,376	PBEEEP Provider Cost for Implementation Assistance ($):	$750
		Total Estimated Implementation Cost ($):	$750

Estimated Annual Total Savings ($):	$2,376	Utility Co-Funding for kWh ($):	$0
Initial Simple Payback (years):	0.32	Utility Co-Funding for kW ($):	$0
Simple Payback w/ Utility Co-Funding (years):	0.32	Utility Co-Funding for therms ($):	$0
GHG Avoided in U.S. Tons (C02e):	39	Utility Co-Funding - Estimated Total ($):	$0

Current Project as Percentage of Total project			
Percent Savings (Costs basis)	4.6%	Percent of Implementation Costs:	1.6%

PBEEEP was made possible with funding from the U.S. Department of Energy and the MN Department of Commerce.

Findings Details

Building: Main Campus

FWB Number:	10201	Eco Number:	8
Site:	Rochester CTC	Date/Time Created:	4/30/2012

Investigation Finding:	CHWS Temp does not reset and is maintained at a constant supply temp.	Date Identified:	6/5/2011
Description of Finding:	The existing chillers (Coffman, Sci Tech)maintain a constant chilled water temperature. They have increased capacity and efficiency if the chilled water supply temperature is allowed to increase up to 50 degrees with the outdoor air temperature is not near design.		
Equipment or System(s):	Chiller Plant	Finding Category:	Controls (Reset Schedules)
Finding Type:	CHW Supply Temperature Reset is not implemented or is sub-optimal		

Implementer:	Controls Contractor.	Benefits:	The chillers have increased efficiency at warmer supply water temperatures. This results in energy savings when air conditioning loads are light.
Baseline Documentation Method:	BMS screenshots and trend data of the CHWS and OAT temperature show that there is no temperature reset schedule for these chillers.		
Measure:	Add Chilled Water temperature reset based on Outdoor air temperature to Coffman Hall Chiller 1 and Sci Tech Chillers 1,2		
Recommendation for Implementation:	The controls contractor (2 Barber Coleman system chillers, 1 Honeywell) shall program the CHWS temperature on Coffman Chiller 1 and Sci Tech Chillers 1,2 to reset. From 80°F (adj) to 65°F (adj) outside temperature, the CHWS temp shall be raised linearly from 44°F (adj) to 50°F (adj).		
Evidence of Implementation Method:	The BMS shall have adjustable setpoints. Trend logs of the CHWS and OAT will show that as the OAT drops below 80, the CHWS temp will increase. Also trend multiple AHUs Clg valves, DAT temps and DAT setpoints. Trend every 15 minutes for 2 weeks. CHWS will rise as OAT drops. AHU DATs will rise up to 60 and maintain space temps.		

Annual Electric Savings (kWh):	14,258	Contractor Cost ($):	$4,050
Estimated Annual kWh Savings ($):	$750	PBEEEP Provider Cost for Implementation Assistance ($):	$1,000
		Total Estimated Implementation Cost ($):	$5,050

Estimated Annual Total Savings ($):	$750	Utility Co-Funding for kWh ($):	$0
Initial Simple Payback (years):	6.73	Utility Co-Funding for kW ($):	$0
Simple Payback w/ Utility Co-Funding (years):	6.73	Utility Co-Funding for therms ($):	$0
GHG Avoided in U.S. Tons (C02e):	12	Utility Co-Funding - Estimated Total ($):	$0

Current Project as Percentage of Total project			
Percent Savings (Costs basis)	1.4%	Percent of Implementation Costs:	10.9%

PBEEEP was made possible with funding from the U.S. Department of Energy and the MN Department of Commerce.

Findings Details

Building: Main Campus

FWB Number:	10201	Eco Number:	9
Site:	Rochester CTC	Date/Time Created:	4/30/2012

Investigation Finding:	Data center cooling units are constant volume fans. Liebert makes a retrofit kit for these units to	Date Identified:	9/10/2011
Description of Finding:	The two existing Computer Room Air Conditioners (CRAC) in the Singley Hall data center are constant volume fans that run 24/7 at full speed no mater what the heat load in the data center is. Liebert makes a retrofit kit for these units to convert them to VFD control for the fans.		
Equipment or System(s):	AHU with cooling only	Finding Category:	Variable Frequency Drives (VFD)
Finding Type:	VFD Retrofit - Fans		

Implementer:	Contractor.	Benefits:	The fans will slow down when the data center is not at full capacity and eliminate unnecessary fan energy.
Baseline Documentation Method:	Visual inspection shows standard controls for fan motor and no VFD. The fans are always running 100% when the unit is on. These units are not on the BMS.		
Measure:	Provide Liebert or Stulz retrofit kit to add VFD control to the unit and slow the fan down when the data center is not at full load.		
Recommendation for Implementation:	VFD retrofit kits will be installed and onboard computer will control the fan speed based on return air temperature with the cooling valve. The fans will be allowed to slow down to 60% to save fan energy while still maintaining airflow through the data center.		
Evidence of Implementation Method:	Visual inspection of the unit will show the installed VFD inside the unit and the controls will be set up to control the fan speed based on return air temp. New controller will show fan speed. Fan speeds are expected to be between 60% and 80%. This will show on the control panel. It will also be observed that only one unit will be running. Return air temperatures are expected to increase from 75-80 to 80-90 degrees. The control panel will also have settings for which unit is lead and lag and track unit runtime. Unit runtime will be noted from the control panel and verified that only one unit is running for a two week period.		

Annual Electric Savings (kWh):	34,252	Contractor Cost ($):	$12,800
Estimated Annual kWh Savings ($):	$1,802	PBEEEP Provider Cost for Implementation Assistance ($):	$2,500
		Total Estimated Implementation Cost ($):	$15,300

Estimated Annual Total Savings ($):	$1,802	Utility Co-Funding for kWh ($):	$0
Initial Simple Payback (years):	8.49	Utility Co-Funding for kW ($):	$0
Simple Payback w/ Utility Co-Funding (years):	8.49	Utility Co-Funding for therms ($):	$0
GHG Avoided in U.S. Tons (C02e):	29	Utility Co-Funding - Estimated Total ($):	$0

Current Project as Percentage of Total project			
Percent Savings (Costs basis)	3.5%	Percent of Implementation Costs:	33.2%

Findings Details

Building: Main Campus

FWB Number:	10201	Eco Number:	10
Site:	Rochester CTC	Date/Time Created:	4/30/2012

Investigation Finding:	Equipment Schedules - Hours of operation	Date Identified:	8/9/2010
Description of Finding:	16 of the AHU's need occupancy schedules or need them redefined in the BARBER COLEMAN BMS system.		
Equipment or System(s):	AHU with heating and cooling	Finding Category:	Equipment Scheduling and Enabling
Finding Type:	Equipment is enabled regardless of need, or such enabling is excessive		

Implementer:	In House Staff	Benefits:	Energy will be saved by turning off fans, closing outdoor air dampers and allowing temperatures to vary. Maintenance costs will be lowered from less wear and tear on the equipment.
Baseline Documentation Method:	Screen captures of schedules and trending of discharge air temperature along with fan enable trends.		
Measure:	Occupancy Schedules will be created in the BMS for all AHU'S and RTU'S and programmed depending on each building's actual usage.		
Recommendation for Implementation:	BARBER COLEMAN system: Calendars need to be defined for each AHU and on/off times set. Equipment affected is AH S1B, AH S2B, AHU 7, AHU 8, AHU L1, AHU L2,ST AHU 1LL, ST AHU 2LL, ST AHU 4, ST AHU 5, ST AHU 6, SS AHU 10, SS AHU 11.		
Evidence of Implementation Method:	Screen captures of completed schedules and trending of fan status and SFVFD for each air handler. Trend data every 15 min for 2 weeks. Schedules should correspond to proposed schedules "Operating Hours.xls" Also trend DAT, DAT setpoint, MAT, RAT, Zone setback setpoint (as applicable), and OAT.		

Annual Electric Savings (kWh):	40,363	Annual Natural Gas Savings (therms):	19,903
Estimated Annual kWh Savings ($):	$2,123	Estimated Annual Natural Gas Savings ($):	$15,086
Contractor Cost ($):	$1,000		
PBEEEP Provider Cost for Implementation Assistance ($):	$1,000		
Total Estimated Implementation Cost ($):	$2,000		

Estimated Annual Total Savings ($):	$17,209	Utility Co-Funding for kWh ($):	$0
Initial Simple Payback (years):	0.12	Utility Co-Funding for kW ($):	$0
Simple Payback w/ Utility Co-Funding (years):	0.12	Utility Co-Funding for therms ($):	$0
GHG Avoided in U.S. Tons (C02e):	145	Utility Co-Funding - Estimated Total ($):	$0

Current Project as Percentage of Total project			
Percent Savings (Costs basis)	33.0%	Percent of Implementation Costs:	4.3%

PBEEEP was made possible with funding from the U.S. Department of Energy and the MN Department of Commerce.

Findings Summary

Building: Heintz Center Main Bldg

Site: Rochester CTC

Eco #	Investigation Finding	Total Cost	Savings	Payback	Co-Funding	Payback Co-Funding	GHG
4	Economizer setpoints are too low.	$750	$2,442	0.31	$0	0.31	40
2	Existing Occupied Schedules do not match occupied times	$2,000	$3,478	0.58	$0	0.58	29
3	Facility does not utilize low flow lavatories for restrooms. Thus they use more hot water than neces	$2,210	$655	3.37	$0	3.37	5
	Total for Findings with Payback 3 years or less:	**$2,750**	**$5,920**	**0.46**	**$0**	**0.46**	**69**
	Total for all Findings:	**$4,960**	**$6,575**	**0.75**	**$0**	**0.75**	**74**

PBEEEP was made possible with funding from the U.S. Department of Energy and the MN Department of Commerce.

Findings Details

Building: Heintz Center Main Bldg

FWB Number:	10203	Eco Number:	2
Site:	Rochester CTC	Date/Time Created:	4/30/2012

Investigation Finding:	Existing Occupied Schedules do not match occupied times	Date Identified:	8/20/2010
Description of Finding:	The Occupied operating schedules for the air handling units do not match when the buildings are in use. Most air handling units are in the occupied mode 24/7. At night they stay in occupied mode and continue to bring in outside air and maintain occupied setpoints. Equipment affected is AHU 1, RTU 1, RTU 2, RTU 6.		
Equipment or System(s):	AHU with heating and cooling	Finding Category:	Equipment Scheduling and Enabling
Finding Type:	Equipment is enabled regardless of need, or such enabling is excessive		

Implementer:	In-House Staff	Benefits:	Reduced heating and cooling loads along with less fan runtime.
Baseline Documentation Method:	Screenshots of equipment schedules and trend logs of equipment.		
Measure:	The equipment schedules in the BMS will be adjusted with the help and approval of security staff.		
Recommendation for Implementation:	The equipment schedules in the BMS will be adjusted with the help and approval of security staff for units RTU 1, RTU 2, RTU 6, AHU 1.		
Evidence of Implementation Method:	In the BMS the equipment schedules will be modified according to the proposed schedule that has been approved by the staff. Trend logs of each air handlers supply fan status and VFD % along with DAT and OAD %.		

Annual Electric Savings (kWh):	10,901	Annual Natural Gas Savings (therms):	3,639
Estimated Annual kWh Savings ($):	$574	Estimated Annual Natural Gas Savings ($):	$2,903
Contractor Cost ($):	$1,000		
PBEEEP Provider Cost for Implementation Assistance ($):	$1,000		
Total Estimated Implementation Cost ($):	$2,000		

Estimated Annual Total Savings ($):	$3,478	Utility Co-Funding for kWh ($):	$0
Initial Simple Payback (years):	0.58	Utility Co-Funding for kW ($):	$0
Simple Payback w/ Utility Co-Funding (years):	0.58	Utility Co-Funding for therms ($):	$0
GHG Avoided in U.S. Tons (C02e):	29	Utility Co-Funding - Estimated Total ($):	$0

Current Project as Percentage of Total project			
Percent Savings (Costs basis)	6.7%	Percent of Implementation Costs:	4.3%

Findings Details

Building: Heintz Center Main Bldg

FWB Number:	10203	Eco Number:	3
Site:	Rochester CTC	Date/Time Created:	4/30/2012

Investigation Finding:	Facility does not utilize low flow lavatories for restrooms. Thus they use more hot water than neces	Date Identified:	6/19/2011
Description of Finding:	Facility does not utilize low flow lavatories for restrooms. Thus they use more hot water than necessary.		
Equipment or System(s):	Other	Finding Category:	Retrofits
Finding Type:	Other Retrofit		

Implementer:	In-House Staff	Benefits:	Reducing the flow rates in the lavatories will reduce the hot water usage at the building. This will save energy by reducing the amount of water that needs to be heated.
Baseline Documentation Method:	The existing aerators are standard 2.2 GPM aerators. This was combined with calculated usage information to determine the existing hot water usage.		
Measure:	Replace aerators in lavatories with 1.0 GPM flow aerators.		
Recommendation for Implementation:	The contractor shall replace the flow control aerator in each lavatory with an aerator that allows a maximum flow of 1.0 GPM. There are 22 lavatories in the public restrooms.		
Evidence of Implementation Method:	Verification of Implementation shall require: Visual inspection of the affected lavatories to verify that the aerators have been changed to low flow versions.		

Annual Natural Gas Savings (therms):	821	Contractor Cost ($):	$1,210
Estimated Annual Natural Gas Savings ($):	$655	PBEEEP Provider Cost for Implementation Assistance ($):	$1,000
		Total Estimated Implementation Cost ($):	$2,210

Estimated Annual Total Savings ($):	$655	Utility Co-Funding for kWh ($):	$0
Initial Simple Payback (years):	3.37	Utility Co-Funding for kW ($):	$0
Simple Payback w/ Utility Co-Funding (years):	3.37	Utility Co-Funding for therms ($):	$0
GHG Avoided in U.S. Tons (C02e):	5	Utility Co-Funding - Estimated Total ($):	$0

Current Project as Percentage of Total project			
Percent Savings (Costs basis)	1.3%	Percent of Implementation Costs:	4.8%

Findings Details

Building: Heintz Center Main Bldg

FWB Number:	10203	Eco Number:	4
Site:	Rochester CTC	Date/Time Created:	4/30/2012

Investigation Finding:	Economizer setpoints are too low.	Date Identified:	9/15/2010
Description of Finding:	The High temp limit of the economizers are set too low. Enabling them to economize to a higher setpoint will maximize the hours per year in economizer mode. Most setpoints are currently at 55 or 65 F.		
Equipment or System(s):	AHU with heating and cooling	Finding Category:	Economizer/Outside Air Loads
Finding Type:	Economizer Operation - Inadequate Free Cooling (Damper failed in minimum or closed position, economizer setpoints not optimized)		

Implementer:	In-house Staff	Benefits:	The Economizer will be able to operate up to a higher temperature, reducing the need for mechanical cooling.
Baseline Documentation Method:	Screenshots of equipment setpoints and trend logs of RAT, MAT, SAT, OAT and space temperatures show OA% and economizer operation.		
Measure:	Raise the economizer high limit setpoint in the BMS to 72 degrees.		
Recommendation for Implementation:	The staff shall reprogram the economizer high limit setpoints for air handling units AHU 1, AHU 2, AHU 9A, AHU 9B, AHU 15, RTU 1, RTU 2, RTU 3, RTU 4, RTU 5, RTU 6, RTU 13. The setpoints in the BMS shall be 72 F		
Evidence of Implementation Method:	Screenshots of equipment setpoints and trend logs of RAT, MAT, SAT, OAT and space temperatures show OA% and economizer operation.		

Annual Electric Savings (kWh):	46,367	Contractor Cost ($):	$0
Estimated Annual kWh Savings ($):	$2,442	PBEEEP Provider Cost for Implementation Assistance ($):	$750
		Total Estimated Implementation Cost ($):	$750

Estimated Annual Total Savings ($):	$2,442	Utility Co-Funding for kWh ($):	$0
Initial Simple Payback (years):	0.31	Utility Co-Funding for kW ($):	$0
Simple Payback w/ Utility Co-Funding (years):	0.31	Utility Co-Funding for therms ($):	$0
GHG Avoided in U.S. Tons (C02e):	40	Utility Co-Funding - Estimated Total ($):	$0

Current Project as Percentage of Total project			
Percent Savings (Costs basis)	4.7%	Percent of Implementation Costs:	1.6%

Findings Summary

Building: Field House- Sports Center

Site: Rochester CTC

Eco #	Investigation Finding	Total Cost	Savings	Payback	Co-Funding	Payback Co-Funding	GHG
3	Existing Occupied Schedules do not match occupied times	$1,750	$5,945	0.29	$0	0.29	48
4	Economizer setpoints are too low.	$750	$1,686	0.44	$0	0.44	27
5	Facility does not utilize low flow shower heads. Thus they use more hot water than necessary.	$3,950	$2,828	1.40	$0	1.40	21
1	Facility does not utilize low flow lavatories for restrooms. Thus they use more hot water than neces	$3,200	$453	7.07	$0	7.07	3
	Total for Findings with Payback 3 years or less:	**$6,450**	**$10,460**	**0.62**	**$0**	**0.62**	**97**
	Total for all Findings:	**$9,650**	**$10,912**	**0.88**	**$0**	**0.88**	**100**

PBEEEP was made possible with funding from the U.S. Department of Energy and the MN Department of Commerce.

Findings Details

Building: Field House- Sports Center

FWB Number:	10202	Eco Number:	1
Site:	Rochester CTC	Date/Time Created:	4/30/2012

Investigation Finding:	Facility does not utilize low flow lavatories for restrooms. Thus they use more hot water than neces	Date Identified:	6/19/2011
Description of Finding:	Facility does not utilize low flow lavatories for restrooms. Thus they use more hot water than necessary.		
Equipment or System(s):	Other	Finding Category:	Retrofits
Finding Type:	Other Retrofit		

Implementer:	In-house Staff	Benefits:	Reducing the flow rates in the lavatories will reduce the hot water usage at the building. This will save energy by reducing the amount of water that needs to be heated.
Baseline Documentation Method:	The existing aerators are standard 2.2 GPM aerators. This was combined with calculated usage information to determine the existing hot water usage.		
Measure:	Replace aerators in lavatories with 1.0 GPM flow aerators.		
Recommendation for Implementation:	The maintenance staff shall replace the flow control aerator in each OF THE 40 lavatory with an aerator that allows a maximum flow of 1.0 GPM. The faucets are in the public restrooms and locker rooms.		
Evidence of Implementation Method:	Verification of Implementation shall require: Visual inspection of the affected lavatories to verify that the aerators have been changed to low flow versions.		

Annual Natural Gas Savings (therms):	597	Contractor Cost ($):	$2,200
Estimated Annual Natural Gas Savings ($):	$453	PBEEEP Provider Cost for Implementation Assistance ($):	$1,000
		Total Estimated Implementation Cost ($):	$3,200

Estimated Annual Total Savings ($):	$453	Utility Co-Funding for kWh ($):	$0
Initial Simple Payback (years):	7.07	Utility Co-Funding for kW ($):	$0
Simple Payback w/ Utility Co-Funding (years):	7.07	Utility Co-Funding for therms ($):	$0
GHG Avoided in U.S. Tons (C02e):	3	Utility Co-Funding - Estimated Total ($):	$0

Current Project as Percentage of Total project			
Percent Savings (Costs basis)	0.9%	Percent of Implementation Costs:	6.9%

PBEEEP was made possible with funding from the U.S. Department of Energy and the MN Department of Commerce.

Findings Details

Building: Field House- Sports Center

FWB Number:	10202	Eco Number:	3
Site:	Rochester CTC	Date/Time Created:	4/30/2012

Investigation Finding:	Existing Occupied Schedules do not match occupied times	Date Identified:	3/20/2011
Description of Finding:	The Occupied operating schedules for the air handling units do not match when the buildings are in use.		
Equipment or System(s):	AHU with heating and cooling	Finding Category:	Equipment Scheduling and Enabling
Finding Type:	Equipment is enabled regardless of need, or such enabling is excessive		

Implementer:	In-House Staff	Benefits:	Reduced heating and cooling loads along with less fan runtime.
Baseline Documentation Method:	Screenshots of equipment schedules and trend logs of equipment.		
Measure:	The equipment schedules in the BMS will be adjusted with the help and approval of maintenance staff.		
Recommendation for Implementation:	The equipment schedules in the BMS will be adjusted with the help and approval of maintenance staff. Equipment affected is AHU 3, AHU 4, AHU 6.		
Evidence of Implementation Method:	In the BMS the equipment schedules will be modified according to the proposed schedule that has been approved by the staff.		

Annual Electric Savings (kWh):	10,556	Annual Natural Gas Savings (therms):	7,111
Estimated Annual kWh Savings ($):	$555	Estimated Annual Natural Gas Savings ($):	$5,390
Contractor Cost ($):	$1,000		
PBEEEP Provider Cost for Implementation Assistance ($):	$750		
Total Estimated Implementation Cost ($):	$1,750		

Estimated Annual Total Savings ($):	$5,945	Utility Co-Funding for kWh ($):	$0
Initial Simple Payback (years):	0.29	Utility Co-Funding for kW ($):	$0
Simple Payback w/ Utility Co-Funding (years):	0.29	Utility Co-Funding for therms ($):	$0
GHG Avoided in U.S. Tons (C02e):	48	Utility Co-Funding - Estimated Total ($):	$0

Current Project as Percentage of Total project			
Percent Savings (Costs basis)	11.4%	Percent of Implementation Costs:	3.8%

Findings Details

Building: Field House- Sports Center

FWB Number:	10202	Eco Number:	4
Site:	Rochester CTC	Date/Time Created:	4/30/2012

Investigation Finding:	Economizer setpoints are too low.	Date Identified:	9/15/2010
Description of Finding:	The High temp limit of the economizers are set too low. Enabling them to economize to a higher setpoint will maximize the hours per year in economizer mode. Most setpoints are currently at 55 or 65 F.		
Equipment or System(s):	AHU with heating and cooling	Finding Category:	Economizer/Outside Air Loads
Finding Type:	Economizer Operation - Inadequate Free Cooling (Damper failed in minimum or closed position, economizer setpoints not optimized)		

Implementer:	In-house Staff	Benefits:	The Economizer will be able to operate up to a higher temperature, reducing the need for mechanical cooling.
Baseline Documentation Method:	Screenshots of equipment setpoints and trend logs of RAT, MAT, SAT, OAT and space temperatures show OA% and economizer operation.		
Measure:	Raise the economizer high limit setpoint in the BMS to 72 degrees.		
Recommendation for Implementation:	The staff shall reprogram the economizer high limit setpoints for air handling units AHU 2, 3, 4, 5, and 6. The setpoints in the BMS shall be 72 F		
Evidence of Implementation Method:	Screenshots of equipment setpoints and trend logs of RAT, MAT, SAT, OAT and space temperatures show OA% and economizer operation.		

Annual Electric Savings (kWh):	32,050	Contractor Cost ($):	$0
Estimated Annual kWh Savings ($):	$1,686	PBEEEP Provider Cost for Implementation Assistance ($):	$750
		Total Estimated Implementation Cost ($):	$750

Estimated Annual Total Savings ($):	$1,686	Utility Co-Funding for kWh ($):	$0
Initial Simple Payback (years):	0.44	Utility Co-Funding for kW ($):	$0
Simple Payback w/ Utility Co-Funding (years):	0.44	Utility Co-Funding for therms ($):	$0
GHG Avoided in U.S. Tons (C02e):	27	Utility Co-Funding - Estimated Total ($):	$0

Current Project as Percentage of Total project			
Percent Savings (Costs basis)	3.2%	Percent of Implementation Costs:	1.6%

PBEEEP was made possible with funding from the U.S. Department of Energy and the MN Department of Commerce.

Findings Details

Building: Field House- Sports Center

FWB Number:	10202	Eco Number:	5
Site:	Rochester CTC	Date/Time Created:	4/30/2012

Investigation Finding:	Facility does not utilize low flow shower heads. Thus they use more hot water than necessary.	Date Identified:	6/19/2011
Description of Finding:	Facility does not utilize low flow shower heads in the locker rooms. Thus they use more hot water than necessary.		
Equipment or System(s):	Other	Finding Category:	Retrofits
Finding Type:	Other Retrofit		

Implementer:	In-house Staff	Benefits:	Reducing the flow rates in theshowers will reduce the hot water usage at the building. This will save energy by reducing the amount of water that needs to be heated.
Baseline Documentation Method:	The existing showerheads are standard 2.5 GPM showerheads. This was combined with calculated usage information to determine the existing hot water usage.		
Measure:	Replace showerheads with 1.5GPM heads.		
Recommendation for Implementation:	The staff shall replace the shower head in each locker room shower that allows a maximum flow of 1.5 GPM. There are 40 showers in the locker rooms.		
Evidence of Implementation Method:	Verification of Implementation shall require: Visual inspection of the affected showers to verify that the showerheads have been changed to low flow versions.		

Annual Natural Gas Savings (therms):	3,732	Contractor Cost ($):	$3,200
Estimated Annual Natural Gas Savings ($):	$2,828	PBEEEP Provider Cost for Implementation Assistance ($):	$750
		Total Estimated Implementation Cost ($):	$3,950

Estimated Annual Total Savings ($):	$2,828	Utility Co-Funding for kWh ($):	$0
Initial Simple Payback (years):	1.40	Utility Co-Funding for kW ($):	$0
Simple Payback w/ Utility Co-Funding (years):	1.40	Utility Co-Funding for therms ($):	$0
GHG Avoided in U.S. Tons (C02e):	21	Utility Co-Funding - Estimated Total ($):	$0

Current Project as Percentage of Total project			
Percent Savings (Costs basis)	5.4%	Percent of Implementation Costs:	8.6%

Deleted Findings Summary

Building: Main Campus
Site: Rochester CTC

Eco #	Investigation Finding	Total Cost	Savings	Payback	Co-Funding	Payback Co-Funding	GHG
2	Three Way valves at Science Building chilled water heat exchanger do not close completely.	$0	$0	0.00	$0	0.00	0
4	Old non-energy efficient lights fixtures and existing manual control of existing lighting fixtures	$0	$0	0.00	$0	0.00	0
6	Minimum OA %	$0	$0	0.00	$0	0.00	0
7	Fans do not have VFDs installed.	$0	$0	0.00	$0	0.00	0
	Total for Findings with Payback 3 years or less:	**$0**	**$0**	**0.00**	**$0**	**0.00**	**0**
	Total for all Findings:	**$0**	**$0**	**0.00**	**$0**	**0.00**	**0**

PBEEEP was made possible with funding from the U.S. Department of Energy and the MN Department of Commerce.

Deleted Findings Details

PBEEEP State Government

Building: Main Campus

FWB Number:	10201	Eco Number:	2
Site:	Rochester CTC	Date/Time Created:	4/30/2012

Investigation Finding:	Three Way valves at Science Building chilled water heat exchanger do not close completely.	Date Identified:	8/10/2010
Description of Finding:	The chilled water system has a waterside economizer heat exchanger on the chilled water. The three way valves are not closing completely to divert water to the chillers. This causes some flow through the heat exchanger when it is not wanted. Chilled water from the chillers cools down the condenser water before it goes up to the cooling towers.		
Equipment or System(s):	Chiller Plant	Finding Category:	Deleted
Finding Type:	Finding Deleted by Provider		

Implementer:		Benefits:	Energy will be saved by no cooling the condenser water before it goes up to the cooling towers.
Baseline Documentation Method:	Screen captures of operation with manual shut off valves open and closed.		
Measure:	The three way valves that divert chilled water to the heat exchanger need to be rebuilt and seals replaced.		
Recommendation for Implementation:	Measure is not viable. Not enough data to provide an accurate calculation.		
Evidence of Implementation Method:			

Estimated Annual Total Savings ($):	$0	Utility Co-Funding for kWh ($):	$0
Initial Simple Payback (years):	0.00	Utility Co-Funding for kW ($):	$0
Simple Payback w/ Utility Co-Funding (years):	0.00	Utility Co-Funding for therms ($):	$0
GHG Avoided in U.S. Tons (C02e):	0	Utility Co-Funding - Estimated Total ($):	$0

Current Project as Percentage of Total project			
Percent Savings (Costs basis)	0.0%	Percent of Implementation Costs:	0.0%

PBEEEP was made possible with funding from the U.S. Department of Energy and the MN Department of Commerce.

Deleted Findings Details

PBEEEP State Government

Building: Main Campus

FWB Number:	10201	Eco Number:	4
Site:	Rochester CTC	Date/Time Created:	4/30/2012

Investigation Finding:	Old non-energy efficient lights fixtures and existing manual control of existing lighting fixtures	Date Identified:	10/31/2011
Description of Finding:	There are 1817 existing lighting fixtures withT-12 lamp/ballast fluorescent fixtures or incandescent lamps in the building. There are 592 plus rooms or spaces in the building with manual lighting controls		
Equipment or System(s):	Interior Lighting	Finding Category:	Deleted
Finding Type:	Finding Deleted by Provider		

Implementer:		Benefits:	
Baseline Documentation Method:	Site review of the building was used to determine the number of low energy efficient lighting fixtures and rooms/space with manual lighting controls		
Measure:	Final investigation of this finding establishes that the energy saving and the implementation cost does not provide a payback with-in the PBEEEP standards		
Recommendation for Implementation:	Measure is not viable. Payback exceeds limitation.		
Evidence of Implementation Method:			

Estimated Annual Total Savings ($):	$0	Utility Co-Funding for kWh ($):	$0
Initial Simple Payback (years):	0.00	Utility Co-Funding for kW ($):	$0
Simple Payback w/ Utility Co-Funding (years):	0.00	Utility Co-Funding for therms ($):	$0
GHG Avoided in U.S. Tons (C02e):	0	Utility Co-Funding - Estimated Total ($):	$0

Current Project as Percentage of Total project			
Percent Savings (Costs basis)	0.0%	Percent of Implementation Costs:	0.0%

PBEEEP was made possible with funding from the U.S. Department of Energy and the MN Department of Commerce.

Deleted Findings Details

PBEEEP State Government

Building: Main Campus

FWB Number:	10201	Eco Number:	6
Site:	Rochester CTC	Date/Time Created:	4/30/2012

Investigation Finding:	Minimum OA %	Date Identified:	10/15/2011
Description of Finding:	ST AHU-6 and SS AHU-11 bring in more Outdoor Air than ASHRAE requires. Trend logs for the units show high % of outdoor air with not as much modulation indicating a lack of damper control.		
Equipment or System(s):	AHU with heating and cooling	Finding Category:	Deleted
Finding Type:	Finding Deleted by Provider		

Implementer:		Benefits:	
Baseline Documentation Method:	Trend logs of RAT, MAT, OAT show % of OA. Compared to an ASHRAE calc for the space, they are over ventilating the space.		
Measure:	Reprogram outdoor air dampers and mixed air dampers to control to a lower OA %.		
Recommendation for Implementation:			
Evidence of Implementation Method:			

Estimated Annual Total Savings ($):	$0	Utility Co-Funding for kWh ($):	$0
Initial Simple Payback (years):	0.00	Utility Co-Funding for kW ($):	$0
Simple Payback w/ Utility Co-Funding (years):	0.00	Utility Co-Funding for therms ($):	$0
GHG Avoided in U.S. Tons (C02e):	0	Utility Co-Funding - Estimated Total ($):	$0

Current Project as Percentage of Total project			
Percent Savings (Costs basis)	0.0%	Percent of Implementation Costs:	0.0%

PBEEEP was made possible with funding from the U.S. Department of Energy and the MN Department of Commerce.

Deleted Findings Details

Building: Main Campus

FWB Number:	10201	Eco Number:	7
Site:	Rochester CTC	Date/Time Created:	4/30/2012

Investigation Finding:	Fans do not have VFDs installed.	Date Identified:	6/15/2011
Description of Finding:	Some air handling units have constant volume fans. Adding a VFD and reducing the fan speed at light loads can reduce the energy used.		
Equipment or System(s):	AHU with heating and cooling	Finding Category:	Deleted
Finding Type:	Finding Deleted by Provider		

Implementer:		Benefits:	
Baseline Documentation Method:	Visual inspection shows standard starter/disconnect. BMS trend data shows no control points for fan speed.		
Measure:	Final investigation of this finding establishes that the energy saving and the implementation cost does not provide a payback with-in the PBEEEP standards		
Recommendation for Implementation:	Measure is not viable. Payback exceeds limitation.		
Evidence of Implementation Method:			

Estimated Annual Total Savings ($):	$0	Utility Co-Funding for kWh ($):	$0
Initial Simple Payback (years):	0.00	Utility Co-Funding for kW ($):	$0
Simple Payback w/ Utility Co-Funding (years):	0.00	Utility Co-Funding for therms ($):	$0
GHG Avoided in U.S. Tons (C02e):	0	Utility Co-Funding - Estimated Total ($):	$0

Current Project as Percentage of Total project			
Percent Savings (Costs basis)	0.0%	Percent of Implementation Costs:	0.0%

Deleted Findings Summary

Building: Heintz Center Main Bldg
Site: Rochester CTC

Eco #	Investigation Finding	Total Cost	Savings	Payback	Co-Funding	Payback Co-Funding	GHG
1	Existing lighting fixtures have old style non energy efficient fluorescent and incandescent lamps. E	$0	$0	0.00	$0	0.00	0
5	Fans do not have VFDs installed.	$0	$0	0.00	$0	0.00	0
	Total for Findings with Payback 3 years or less:	**$0**	**$0**	**0.00**	**$0**	**0.00**	**0**
	Total for all Findings:	**$0**	**$0**	**0.00**	**$0**	**0.00**	**0**

PBEEEP was made possible with funding from the U.S. Department of Energy and the MN Department of Commerce.

Deleted Findings Details

Building: Heintz Center Main Bldg

FWB Number:	10203	Eco Number:	1
Site:	Rochester CTC	Date/Time Created:	4/30/2012

Investigation Finding:	Existing lighting fixtures have old style non energy efficient fluorescent and incandescent lamps. E	Date Identified:	11/2/2011
Description of Finding:	Site survey established that there are 446 existing fixtures that can be retrofitted with new T-8 32 watt lamps/ballast and/or removal of existing incandescent lamps and have them replaced with screw in CFL fluorescent lamps. Site survey established that there are 179 rooms/spaces that have manual controls that can be upgraded with automatic lighting control occupancy sensors		
Equipment or System(s):	Interior Lighting	Finding Category:	Deleted
Finding Type:	Finding Deleted by Provider		

Implementer:		Benefits:	Reduced energy used to light the spaces.
Baseline Documentation Method:	Data from EEA trend logs for other PBEEEP projects were used to establish the average hours per day the lights would be on in a give space. The days per year were based on the schools 2010 to 2011 published calendar		
Measure:	Final review of the energy savings implementation cost established that this findings payback does not qualify to PBEEEP standards		
Recommendation for Implementation:	The lights are not on enough hours a year to provide enough savings. The payback period exceeds limitations.		
Evidence of Implementation Method:			

Estimated Annual Total Savings ($):	$0	Utility Co-Funding for kWh ($):	$0
Initial Simple Payback (years):	0.00	Utility Co-Funding for kW ($):	$0
Simple Payback w/ Utility Co-Funding (years):	0.00	Utility Co-Funding for therms ($):	$0
GHG Avoided in U.S. Tons (C02e):	0	Utility Co-Funding - Estimated Total ($):	$0

Current Project as Percentage of Total project			
Percent Savings (Costs basis)	0.0%	Percent of Implementation Costs:	0.0%

Deleted Findings Details

Building: Heintz Center Main Bldg

FWB Number:	10203	Eco Number:	5
Site:	Rochester CTC	Date/Time Created:	4/30/2012

Investigation Finding:	Fans do not have VFDs installed.	Date Identified:	6/15/2011
Description of Finding:	Some air handling units have constant volume fans. Adding a VFD and reducing the fan speed at light loads can reduce the energy used.		
Equipment or System(s):	AHU with heating and cooling	Finding Category:	Deleted
Finding Type:	Finding Deleted by Provider		

Implementer:		Benefits:	
Baseline Documentation Method:	Visual inspection shows standard starter/disconnect. BMS trend data shows no control points for fan speed.		
Measure:			
Recommendation for Implementation:	VFDs could be added to the RTU's but due to the payback of around 5 years and the age of the equipment, we recommend the RTUs be replaced.		
Evidence of Implementation Method:			

Estimated Annual Total Savings ($):	$0	Utility Co-Funding for kWh ($):	$0
Initial Simple Payback (years):	0.00	Utility Co-Funding for kW ($):	$0
Simple Payback w/ Utility Co-Funding (years):	0.00	Utility Co-Funding for therms ($):	$0
GHG Avoided in U.S. Tons (C02e):	0	Utility Co-Funding - Estimated Total ($):	$0

Current Project as Percentage of Total project			
Percent Savings (Costs basis)	0.0%	Percent of Implementation Costs:	0.0%

PBEEEP was made possible with funding from the U.S. Department of Energy and the MN Department of Commerce.

Deleted Findings Summary

Building: Field House- Sports Center
Site: Rochester CTC

Eco #	Investigation Finding	Total Cost	Savings	Payback	Co-Funding	Payback Co-Funding	GHG
2	Chilled Water Temp reset	$0	$0	0.00	$0	0.00	0
	Total for Findings with Payback 3 years or less:	**$0**	**$0**	**0.00**	**$0**	**0.00**	**0**
	Total for all Findings:	**$0**	**$0**	**0.00**	**$0**	**0.00**	**0**

PBEEEP was made possible with funding from the U.S. Department of Energy and the MN Department of Commerce.

Deleted Findings Details

Building: Field House- Sports Center

FWB Number:	10202	Eco Number:	2
Site:	Rochester CTC	Date/Time Created:	4/30/2012

Investigation Finding:	Chilled Water Temp reset	Date Identified:	6/15/2011
Description of Finding:	The chiller uses a constant setpoint to control the CHWS to. Resetting this to a higher temp on cooler days can increase the efficiency of the chiller during those times.		
Equipment or System(s):	Chiller Plant	Finding Category:	Deleted
Finding Type:	Finding Deleted by Provider		

Implementer:		Benefits:	
Baseline Documentation Method:	The trend logs of the outdoor air temperature vs chilled water temperature show that the CHWS temp does not change with cooler outdoor temperatures.		
Measure:	Program a temperature reset for the CHWS temp.		
Recommendation for Implementation:			
Evidence of Implementation Method:			

Estimated Annual Total Savings ($):	$0	Utility Co-Funding for kWh ($):	$0
Initial Simple Payback (years):	0.00	Utility Co-Funding for kW ($):	$0
Simple Payback w/ Utility Co-Funding (years):	0.00	Utility Co-Funding for therms ($):	$0
GHG Avoided in U.S. Tons (C02e):	0	Utility Co-Funding - Estimated Total ($):	$0

Current Project as Percentage of Total project			
Percent Savings (Costs basis)	0.0%	Percent of Implementation Costs:	0.0%

PBEEEP was made possible with funding from the U.S. Department of Energy and the MN Department of Commerce.

Comments on the Dome at RCTC from EEA (Jason Lindquist)

The report referenced in the memo indicates various energy saving items. I have some problems with this report and how it pertains to the inflatable dome at RCTC. First, the motor retrofit savings indicates savings as lighting savings when it should be motor savings. Second, the savings are equal for all three types of domes. This tells me that they are running the domes 365 days a year. The RCTC dome is taken down in the summer and only used 5-6 months a year so the savings listed in the report need to be reduced by more than half. This more than doubles the paybacks and what ones that were less than 12 years are now more(after the 0.85 interaction factor is 15 years.). On top of that, most of the energy saving items listed are negated by the fact that they tear down the building every year. Any findings implemented would have to be trusted that they were implemented the next year properly and I don't believe most of them would be done properly the next year. VFDs on fans would be great but do you think they would reinstall the pressure sensors the next year plus calibrate them and test and balance them year after year? Sealing leaks in the building would be great, but after they tear it down and build it again the next year they would just build it the same they did this year. Insulation would be great but I don't know how you do that without making the building more of a permanent structure. We looked at the lighting but based on the yearly runtime, we had a hard time getting anything to payback in 12 years. Night setback temperature was the most viable savings measure and did not work out well with the packaged heater/blower fans for the facility. We realize this facility uses a lot of energy and desparately wanted to have a lot of findings here to save energy but the yearly operating hours and temporary nature of the building make paybacks tough. Energy use is simply going to be high for a fan pressurized air supported structure with non-insulated walls.

PBEEEP State Government

Rev. 2.0 (12/16/2010)

10201 - RCTC/ Main Campus

This checklist is designed to be a resource and reference for Providers and PBEEEP.

Finding Category	Finding Type Number	Finding Type	Relevant Findings (if any)	Finding Location	Reason for no relevant finding	Notes
a. Equipment Scheduling and Enabling:	a.1 (1)	Time of Day enabling is excessive	YES	MISC. AHU'S		REVISED TOD SCHEDULES. FINDING 1.
	a.2 (2)	Equipment is enabled regardless of need, or such enabling is excessive	NO.		Investigation looked for, but did not find this issue.	
	a.3 (3)	Lighting is on more hours than necessary.	YES			LIGHTING FINDING DOES NOT PAYBACK BASED ON HOURS. FINDING 4
	a.4 (4)	OTHER_Equipment Scheduling/Enabling	NO.		Investigation looked for, but did not find this issue.	
b. Economizer/Outside Air Loads:	b.1 (5)	Economizer Operation – Inadequate Free Cooling (Damper failed in minimum or closed position, economizer setpoints not optimized)	YES	MISC. AHU'S		ECONOMIZER SETPOINTS NOT OPTIMIZED. FINDING 5
	b.2 (6)	Over-Ventilation – Outside air damper failed in an open position. Minimum outside air fraction not set to design specifications or occupancy.	NO.		Investigation looked for, but did not find this issue.	
	b.3 (7)	OTHER_Economizer/OA Loads	NO.		Investigation looked for, but did not find this issue.	
c. Controls Problems:	c.1 (8)	Simultaneous Heating and Cooling is present and excessive	NO.		Investigation looked for, but did not find this issue.	
	c.2 (9)	Sensor/Thermostat needs calibration, relocation/shielding, and/or replacement	YES	Misc AHU'S		Sensors will be reported on Maintenance Report.
	c.3 (10)	Controls "hunt" and/or need Loop Tuning or separation of heating/cooling setpoints	NO.		Investigation looked for, but did not find this issue.	
	c.4 (11)	OTHER_Controls	NO.		Investigation looked for, but did not find this issue.	
d. Controls (Setpoint Changes):	d.1 (12)	Daylighting controls or occupancy sensors need optimization.	YES			FINDING DOES NOT PAYBACK. FINDING 4.
	d.2 (13)	Zone setpoint setup/setback are not implemented or are sub-optimal.	YES	Misc AHU'S		FINDING 1.
	d.3 (14)	Fan Speed Doesn't Vary Sufficiently	YES	MISC. AHU'S		DATA INDICATES CONSTANT FAN SPEED. FINDING 7
	d.4 (15)	Pump Speed Doesn't Vary Sufficiently	NO.		Investigation looked for, but did not find this issue.	
	d.5 (16)	VAV Box Minimum Flow Setpoint is higher than necessary	NO.		Investigation looked for, but did not find this issue.	
	d.6 (17)	Other_Controls (Setpoint Changes)	NO.		Investigation looked for, but did not find this issue.	
e. Controls (Reset Schedules):	e.1 (18)	HW Supply Temperature Reset is not implemented or is sub-optimal	NO.		Investigation looked for, but did not find this issue.	
	e.2 (19)	CHW Supply Temperature Reset is not implemented or is sub-optimal	YES	Misc Chillers		FINDING 8
	e.3 (20)	Supply Air Temperature Reset is not implemented or is sub-optimal	YES	Misc AHU'S		NOT ENOUGH INFO TO CALCULATE PAYBACK.
	e.4 ( )	Supply Duct Static Pressure Reset is not implemented or is sub-optimal	YES	MISC. AHU'S		DATA INDICATES CONSTANT STATIC PRESSURE BUT BMS CAN NOT COLLEC
	e.5 (21)	Condenser Water Temperature Reset is not implemented or is sub-optimal	NO.		Investigation looked for, but did not find this issue.	
	e.6 (22)	Other_Controls (Reset Schedules)	NO.		Investigation looked for, but did not find this issue.	
f. Equipment Efficiency Improvements / Load Reduction:	f.1 (23)	Daylighting Control needs optimization—Spaces are Over-Lit	YES			FINDING FOR LIGHTING CONTROLS DOES NOT PAYBACK.. FINDING 4
	f.2 (24)	Pump Discharge Throttled	NO.		Investigation looked for, but did not find this issue.	
	f.3 (25)	Over-Pumping	NO.		Investigation looked for, but did not find this issue.	
	f.4 (26)	Equipment is oversized for load.	NO.		Investigation looked for, but did not find this issue.	
	f.5 (27)	OTHER_Equipment Efficiency/Load Reduction	NO.		Investigation looked for, but did not find this issue.	
	g.1 (28)	VFD Retrofit - Fans	YES	Data Center Cooling Units.		FINDING 9

PBEEEP State Government

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10201 - RCTC/ Main Campus

This checklist is designed to be a resource and reference for Providers and PBEEEP.

Finding Category	Finding Type Number	Finding Type	Relevant Findings (if any)	Finding Location	Reason for no relevant finding	Notes
g. Variable Frequency Drives (VFD):	g.2 (29)	VFD Retrofit - Pumps	NO.		Investigation looked for, but did not find this issue.	
	g.3 (30)	VFD Retrofit - Motors (process)	NO.		Investigation looked for, but did not find this issue.	
	g.4 (31)	OTHER_VFD	NO.		Investigation looked for, but did not find this issue.	
h. Retrofits:	h.1 (32)	Retrofit - Motors	NO.		Investigation looked for, but did not find this issue.	
	h.2 (33)	Retrofit - Chillers	NO.		Investigation looked for, but did not find this issue.	
	h.3 (34)	Retrofit - Air Conditioners (Air Handling Units, Packaged Unitary Equipment)	NO.		Investigation looked for, but did not find this issue.	Memorial Hall and Plaza Hall have PTAC units that should be retrofitted but the buildings are being gutted and remodeled in 2013.
	h.4 (35)	Retrofit - Boilers	NO.		Investigation looked for, but did not find this issue.	
	h.5 (36)	Retrofit - Packaged Gas fired heating	NO.		Investigation looked for, but did not find this issue.	
	h.6 (37)	Retrofit - Heat Pumps	NO.		Investigation looked for, but did not find this issue.	
	h.7 (38)	Retrofit - Equipment (custom)	NO.		Investigation looked for, but did not find this issue.	
	h.8 (39)	Retrofit - Pumping distribution method	NO.		Investigation looked for, but did not find this issue.	
	h.9 (40)	Retrofit - Energy/Heat Recovery	NO.		Investigation looked for, but did not find this issue.	
	h.10 (41)	Retrofit - System (custom)	NO.		Investigation looked for, but did not find this issue.	
	h.11 (42)	Retrofit - Efficient Lighting	YES			FINDING DOES NOT PAYBACK BASED ON HOURS. FINDING 4
	h.12 (43)	Retrofit - Building Envelope	NO.		Investigation looked for, but did not find this issue.	
	h.13 (44)	Retrofit - Alternative Energy	NO.		Investigation looked for, but did not find this issue.	
	h.14 (45)	OTHER_Retrofit	YES	LOW FLOW LAVS	Investigation looked for, but did not find this issue.	FINDING 3.
i. Maintenance Related Problems:	i.1 (46)	Differed Maintenance from Recommended/Standard	YES		Investigation looked for, but did not find this issue.	SCI TECH HX DAMPERS LEAK. NOT ABLE TO CALCULATE PAYBACK. FINDING
	i.2 (47)	Impurity/Contamination	NO.		Investigation looked for, but did not find this issue.	
	i.3 ( )	Leaky/Stuck Damper	YES	AHU-6, AHU-11		FINDING 6
	i.4 ( )	Leaky/Stuck Valve	NO.		Investigation looked for, but did not find this issue.	
	i.5 (48)	OTHER_Maintenance	NO.		Investigation looked for, but did not find this issue.	
j. OTHER	j.1 (49)	OTHER	NO.		Investigation looked for, but did not find this issue.	

:T ENOUGH DATA TO ACCURATELY PROVE SAVINGS.

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PBEEEP State Government

Rev. 2.0 (12/16/2010)

10203 - RCTC/ Heintz Center

This checklist is designed to be a resource and reference for Providers and PBEEEP.

Finding Category	Finding Type Number	Finding Type	Relevant Findings (if any)	Finding Location	Reason for no relevant finding	Notes
a. Equipment Scheduling and Enabling:	a.1 (1)	Time of Day enabling is excessive	YES	Most AHU'S		ADJUSTED TOD SCHEDULING. FINDING 2
	a.2 (2)	Equipment is enabled regardless of need, or such enabling is excessive	NO.		Investigation looked for, but did not find this issue.	
	a.3 (3)	Lighting is on more hours than necessary.	YES			LIGHTING DOES NOT PAYBACK BASED ON HOURS. FINDING 1.
	a.4 (4)	OTHER_Equipment Scheduling/Enabling	NO.		Investigation looked for, but did not find this issue.	
b. Economizer/Outside Air Loads:	b.1 (5)	Economizer Operation – Inadequate Free Cooling (Damper failed in minimum or closed position, economizer setpoints not optimized)	YES	MISC. AHU'S		ECONOMIZER SETPOINTS NOT OPTIMIZED. FINDING 4
	b.2 (6)	Over-Ventilation – Outside air damper failed in an open position. Minimum outside air fraction not set to design specifications or occupancy.	NO.		Investigation looked for, but did not find this issue.	
	b.3 (7)	OTHER_Economizer/OA Loads	NO.		Investigation looked for, but did not find this issue.	
c. Controls Problems:	c.1 (8)	Simultaneous Heating and Cooling is present and excessive	NO.		Investigation looked for, but did not find this issue.	
	c.2 (9)	Sensor/Thermostat needs calibration, relocation/shielding, and/or replacement	YES	MISC. AHU'S		THERE ARE SOME SENSORS THAT HAVE TROUBLE REPORTING, THEY WILL
	c.3 (10)	Controls "hunt" and/or need Loop Tuning or separation of heating/cooling setpoints	NO.		Investigation looked for, but did not find this issue.	
	c.4 (11)	OTHER_Controls	NO.		Investigation looked for, but did not find this issue.	
d. Controls (Setpoint Changes):	d.1 (12)	Daylighting controls or occupancy sensors need optimization.	NO.		Investigation looked for, but did not find this issue.	LIGHTING DOES NOT PAYBACK BASED ON HOURS.
	d.2 (13)	Zone setpoint setup/setback are not implemented or are sub-optimal.	NO.		Investigation looked for, but did not find this issue.	
	d.3 (14)	Fan Speed Doesn't Vary Sufficiently	NO.		Investigation looked for, but did not find this issue.	
	d.4 (15)	Pump Speed Doesn't Vary Sufficiently	NO.		Investigation looked for, but did not find this issue.	
	d.5 (16)	VAV Box Minimum Flow Setpoint is higher than necessary	NO.		Investigation looked for, but did not find this issue.	
	d.6 (17)	Other_Controls (Setpoint Changes)	NO.		Investigation looked for, but did not find this issue.	
e. Controls (Reset Schedules):	e.1 (18)	HW Supply Temperature Reset is not implemented or is sub-optimal	NO.		Investigation looked for, but did not find this issue.	
	e.2 (19)	CHW Supply Temperature Reset is not implemented or is sub-optimal	NO.		Investigation looked for, but did not find this issue.	
	e.3 (20)	Supply Air Temperature Reset is not implemented or is sub-optimal	NO.		Investigation looked for, but did not find this issue.	
	e.4 ( )	Supply Duct Static Pressure Reset is not implemented or is sub-optimal	YES	MISC. AHU'S		NO VAV DAMPER POSITION INFO FROM BMS PREVENTS FINDING CALCULAT
	e.5 (21)	Condenser Water Temperature Reset is not implemented or is sub-optimal	NO.		Not Relevant	
	e.6 (22)	Other_Controls (Reset Schedules)	NO.		Investigation looked for, but did not find this issue.	
f. Equipment Efficiency Improvements / Load Reduction:	f.1 (23)	Daylighting Control needs optimization—Spaces are Over-Lit	NO.		Investigation looked for, but did not find this issue.	
	f.2 (24)	Pump Discharge Throttled	NO.		Investigation looked for, but did not find this issue.	
	f.3 (25)	Over-Pumping	NO.		Investigation looked for, but did not find this issue.	
	f.4 (26)	Equipment is oversized for load.	NO.		Investigation looked for, but did not find this issue.	
	f.5 (27)	OTHER_Equipment Efficiency/Load Reduction	NO.		Investigation looked for, but did not find this issue.	
	g.1 (28)	VFD Retrofit - Fans	yes	RTUs		Due to the age of the equipment, we recommend replacement rather than retrofit. FII

PBEEEP State Government

Rev. 2.0 (12/16/2010)

10203 - RCTC/ Heintz Center

This checklist is designed to be a resource and reference for Providers and PBEEEP.

Finding Category	Finding Type Number	Finding Type	Relevant Findings (if any)	Finding Location	Reason for no relevant finding	Notes
g. Variable Frequency Drives (VFD):	g.2 (29)	VFD Retrofit - Pumps	NO.		Investigation looked for, but did not find this issue.	
	g.3 (30)	VFD Retrofit - Motors (process)	NO.		Investigation looked for, but did not find this issue.	
	g.4 (31)	OTHER_VFD	NO.		Investigation looked for, but did not find this issue.	
h. Retrofits:	h.1 (32)	Retrofit - Motors	NO.		Not cost-effective to investigate	
	h.2 (33)	Retrofit - Chillers	NO.		Investigation looked for, but did not find this issue.	
	h.3 (34)	Retrofit - Air Conditioners (Air Handling Units, Packaged Unitary Equipment)	NO.		Investigation looked for, but did not find this issue.	
	h.4 (35)	Retrofit - Boilers	NO.		Investigation looked for, but did not find this issue.	
	h.5 (36)	Retrofit - Packaged Gas fired heating	NO.		Investigation looked for, but did not find this issue.	
	h.6 (37)	Retrofit - Heat Pumps	NO.		Not cost-effective to investigate	
	h.7 (38)	Retrofit - Equipment (custom)	NO.		Investigation looked for, but did not find this issue.	
	h.8 (39)	Retrofit - Pumping distribution method	NO.		Investigation looked for, but did not find this issue.	
	h.9 (40)	Retrofit - Energy/Heat Recovery	NO.		Investigation looked for, but did not find this issue.	
	h.10 (41)	Retrofit - System (custom)	NO.		Investigation looked for, but did not find this issue.	
	h.11 (42)	Retrofit - Efficient Lighting	NO.		Investigation looked for, but did not find this issue.	LIGHTING DOES NOT PAYBACK BASED ON HOURS.
	h.12 (43)	Retrofit - Building Envelope	NO.		Investigation looked for, but did not find this issue.	
	h.13 (44)	Retrofit - Alternative Energy	NO.		Investigation looked for, but did not find this issue.	
	h.14 (45)	OTHER_Retrofit	YES	LOW FLOW LAVS		LOW FLOW LAV AERATORS. FINDING 3
i. Maintenance Related Problems:	i.1 (46)	Differed Maintenance from Recommended/Standard	NO.		Investigation looked for, but did not find this issue.	
	i.2 (47)	Impurity/Contamination	NO.		Investigation looked for, but did not find this issue.	
	i.3 ( )	Leaky/Stuck Damper	NO.		Investigation looked for, but did not find this issue.	
	i.4 ( )	Leaky/Stuck Valve	NO.		Investigation looked for, but did not find this issue.	
	i.5 (48)	OTHER_Maintenance	NO.		Investigation looked for, but did not find this issue.	
j. OTHER	j.1 (49)	OTHER	NO.		Investigation looked for, but did not find this issue.	

BE NOTED IN THE MAINTENANCE REPORT.

IONS.

NDING 5.

PBEEEP State Government

Rev. 2.0 (12/16/2010)

10202 - RCTC/ Sports Ctr

This checklist is designed to be a resource and reference for Providers and PBEEEP.

Finding Category	Finding Type Number	Finding Type	Relevant Findings (if any)	Finding Location	Reason for no relevant finding	Notes
a. Equipment Scheduling and Enabling:	a.1 (1)	Time of Day enabling is excessive	YES	Most AHU'S		ADJUSTED TOD SCHEDULING. FINDING 3
	a.2 (2)	Equipment is enabled regardless of need, or such enabling is excessive	NO.		Investigation looked for, but did not find this issue.	
	a.3 (3)	Lighting is on more hours than necessary.	NO.			LIGHTING DOES NOT PAYBACK BASED ON HOURS.
	a.4 (4)	OTHER_Equipment Scheduling/Enabling	NO.		Investigation looked for, but did not find this issue.	
b. Economizer/Outside Air Loads:	b.1 (5)	Economizer Operation – Inadequate Free Cooling (Damper failed in minimum or closed position, economizer setpoints not optimized)	YES	MISC. AHU'S		ECONOMIZER SETPOINTS NOT OPTIMIZED. FINDING 4
	b.2 (6)	Over-Ventilation – Outside air damper failed in an open position. Minimum outside air fraction not set to design specifications or occupancy.	NO.		Investigation looked for, but did not find this issue.	
	b.3 (7)	OTHER_Economizer/OA Loads	NO.		Investigation looked for, but did not find this issue.	
c. Controls Problems:	c.1 (8)	Simultaneous Heating and Cooling is present and excessive	NO.		Investigation looked for, but did not find this issue.	
	c.2 (9)	Sensor/Thermostat needs calibration, relocation/shielding, and/or replacement	YES	MISC. AHU'S		THERE ARE SOME SENSORS THAT HAVE TROUBLE REPORTING, THEY WILL
	c.3 (10)	Controls "hunt" and/or need Loop Tuning or separation of heating/cooling setpoints	NO.		Investigation looked for, but did not find this issue.	
	c.4 (11)	OTHER_Controls	NO.		Investigation looked for, but did not find this issue.	
d. Controls (Setpoint Changes):	d.1 (12)	Daylighting controls or occupancy sensors need optimization.	NO.		Investigation looked for, but did not find this issue.	LIGHTING DOES NOT PAYBACK BASED ON HOURS.
	d.2 (13)	Zone setpoint setup/setback are not implemented or are sub-optimal.	NO.		Investigation looked for, but did not find this issue.	
	d.3 (14)	Fan Speed Doesn't Vary Sufficiently	NO.		Investigation looked for, but did not find this issue.	
	d.4 (15)	Pump Speed Doesn't Vary Sufficiently	NO.		Investigation looked for, but did not find this issue.	
	d.5 (16)	VAV Box Minimum Flow Setpoint is higher than necessary	NO.		Investigation looked for, but did not find this issue.	
	d.6 (17)	Other_Controls (Setpoint Changes)	NO.		Investigation looked for, but did not find this issue.	
e. Controls (Reset Schedules):	e.1 (18)	HW Supply Temperature Reset is not implemented or is sub-optimal	NO.		Investigation looked for, but did not find this issue.	
	e.2 (19)	CHW Supply Temperature Reset is not implemented or is sub-optimal	YES			FINDING 2
	e.3 (20)	Supply Air Temperature Reset is not implemented or is sub-optimal	NO.		Investigation looked for, but did not find this issue.	
	e.4 ( )	Supply Duct Static Pressure Reset is not implemented or is sub-optimal	YES	MISC. AHU'S		NO VAV DAMPER POSITION INFO FROM BMS PREVENTS FINDING CALCULAT
	e.5 (21)	Condenser Water Temperature Reset is not implemented or is sub-optimal	NO.		Not Relevant	
	e.6 (22)	Other_Controls (Reset Schedules)	NO.		Investigation looked for, but did not find this issue.	
f. Equipment Efficiency Improvements / Load Reduction:	f.1 (23)	Daylighting Control needs optimization—Spaces are Over-Lit	NO.		Investigation looked for, but did not find this issue.	
	f.2 (24)	Pump Discharge Throttled	NO.		Investigation looked for, but did not find this issue.	
	f.3 (25)	Over-Pumping	NO.		Investigation looked for, but did not find this issue.	
	f.4 (26)	Equipment is oversized for load.	NO.		Investigation looked for, but did not find this issue.	
	f.5 (27)	OTHER_Equipment Efficiency/Load Reduction	NO.		Investigation looked for, but did not find this issue.	
	g.1 (28)	VFD Retrofit - Fans	NO.		Investigation looked for, but did not find this issue.	

PBEEEP State Government

Rev. 2.0 (12/16/2010)

10202 - RCTC/ Sports Ctr

This checklist is designed to be a resource and reference for Providers and PBEEEP.

Finding Category	Finding Type Number	Finding Type	Relevant Findings (if any)	Finding Location	Reason for no relevant finding	Notes
g. Variable Frequency Drives (VFD):	g.2 (29)	VFD Retrofit - Pumps	NO.		Investigation looked for, but did not find this issue.	
	g.3 (30)	VFD Retrofit - Motors (process)	NO.		Investigation looked for, but did not find this issue.	
	g.4 (31)	OTHER_VFD	NO.		Investigation looked for, but did not find this issue.	
h. Retrofits:	h.1 (32)	Retrofit - Motors	NO.		Not cost-effective to investigate	
	h.2 (33)	Retrofit - Chillers	NO.		Investigation looked for, but did not find this issue.	
	h.3 (34)	Retrofit - Air Conditioners (Air Handling Units, Packaged Unitary Equipment)	NO.		Investigation looked for, but did not find this issue.	
	h.4 (35)	Retrofit - Boilers	NO.		Investigation looked for, but did not find this issue.	
	h.5 (36)	Retrofit - Packaged Gas fired heating	NO.		Investigation looked for, but did not find this issue.	
	h.6 (37)	Retrofit - Heat Pumps	NO.		Not cost-effective to investigate	
	h.7 (38)	Retrofit - Equipment (custom)	NO.		Investigation looked for, but did not find this issue.	
	h.8 (39)	Retrofit - Pumping distribution method	NO.		Investigation looked for, but did not find this issue.	
	h.9 (40)	Retrofit - Energy/Heat Recovery	NO.		Investigation looked for, but did not find this issue.	
	h.10 (41)	Retrofit - System (custom)	NO.		Investigation looked for, but did not find this issue.	
	h.11 (42)	Retrofit - Efficient Lighting	NO.		Investigation looked for, but did not find this issue.	LIGHTING DOES NOT PAYBACK BASED ON HOURS.
	h.12 (43)	Retrofit - Building Envelope	NO.		Investigation looked for, but did not find this issue.	
	h.13 (44)	Retrofit - Alternative Energy	NO.		Investigation looked for, but did not find this issue.	
	h.14 (45)	OTHER_Retrofit	YES	FAUCETS AND SHOWERS		LOW FLOW LAV AERATORS AND SHOWERHEADS. FINDING 1.
i. Maintenance Related Problems:	i.1 (46)	Differed Maintenance from Recommended/Standard	NO.		Investigation looked for, but did not find this issue.	
	i.2 (47)	Impurity/Contamination	NO.		Investigation looked for, but did not find this issue.	
	i.3 ( )	Leaky/Stuck Damper	NO.		Investigation looked for, but did not find this issue.	
	i.4 ( )	Leaky/Stuck Valve	NO.		Investigation looked for, but did not find this issue.	
	i.5 (48)	OTHER_Maintenance	NO.		Investigation looked for, but did not find this issue.	
j. OTHER	j.1 (49)	OTHER	NO.		Investigation looked for, but did not find this issue.	

BE NOTED IN THE MAINTENANCE REPORT.

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Investigation Checklist

PBEEEP State Government

Rev. 2.0 (12/16/2010)

10204 - RCTC/ Stadium-Dome

This checklist is designed to be a resource and reference for Providers and PBEEEP.

Finding Category	Finding Type Number	Finding Type	Relevant Findings (if any)	Finding Location	Reason for no relevant finding	Notes
a. Equipment Scheduling and Enabling:	a.1 (1)	Time of Day enabling is excessive	NO.		Investigation looked for, but did not find this issue.	
	a.2 (2)	Equipment is enabled regardless of need, or such enabling is excessive	NO.		Investigation looked for, but did not find this issue.	
	a.3 (3)	Lighting is on more hours than necessary.	YES			Type of lighting and use of building does not allow for automatic lightng controls
	a.4 (4)	OTHER_Equipment Scheduling/Enabling	NO.		Investigation looked for, but did not find this issue.	
b. Economizer/Outside Air Loads:	b.1 (5)	Economizer Operation – Inadequate Free Cooling (Damper failed in minimum or closed position, economizer setpoints not optimized)	NO.		Investigation looked for, but did not find this issue.	
	b.2 (6)	Over-Ventilation – Outside air damper failed in an open position. Minimum outside air fraction not set to design specifications or occupancy.	NO.		Investigation looked for, but did not find this issue.	
	b.3 (7)	OTHER_Economizer/OA Loads	NO.		Investigation looked for, but did not find this issue.	
c. Controls Problems:	c.1 (8)	Simultaneous Heating and Cooling is present and excessive	NO.		Investigation looked for, but did not find this issue.	
	c.2 (9)	Sensor/Thermostat needs calibration, relocation/shielding, and/or replacement	NO.		Investigation looked for, but did not find this issue.	
	c.3 (10)	Controls "hunt" and/or need Loop Tuning or separation of heating/cooling setpoints	NO.		Investigation looked for, but did not find this issue.	
	c.4 (11)	OTHER_Controls	NO.		Investigation looked for, but did not find this issue.	
d. Controls (Setpoint Changes):	d.1 (12)	Daylighting controls or occupancy sensors need optimization.	YES			Type of lighting and use of building does not allow for automatic lightng controls
	d.2 (13)	Zone setpoint setup/setback are not implemented or are sub-optimal.	NO.		Investigation looked for, but did not find this issue.	
	d.3 (14)	Fan Speed Doesn't Vary Sufficiently	NO.		Investigation looked for, but did not find this issue.	
	d.4 (15)	Pump Speed Doesn't Vary Sufficiently	NO.		Investigation looked for, but did not find this issue.	
	d.5 (16)	VAV Box Minimum Flow Setpoint is higher than necessary	NO.		Investigation looked for, but did not find this issue.	
	d.6 (17)	Other_Controls (Setpoint Changes)	NO.		Investigation looked for, but did not find this issue.	
e. Controls (Reset Schedules):	e.1 (18)	HW Supply Temperature Reset is not implemented or is sub-optimal	NO.		Investigation looked for, but did not find this issue.	
	e.2 (19)	CHW Supply Temperature Reset is not implemented or is sub-optimal	NO.		Investigation looked for, but did not find this issue.	
	e.3 (20)	Supply Air Temperature Reset is not implemented or is sub-optimal	NO.		Investigation looked for, but did not find this issue.	
	e.4 ( )	Supply Duct Static Pressure Reset is not implemented or is sub-optimal	NO.		Investigation looked for, but did not find this issue.	
	e.5 (21)	Condenser Water Temperature Reset is not implemented or is sub-optimal	NO.		Investigation looked for, but did not find this issue.	
	e.6 (22)	Other_Controls (Reset Schedules)	NO.		Investigation looked for, but did not find this issue.	
f. Equipment Efficiency Improvements / Load Reduction:	f.1 (23)	Daylighting Control needs optimization—Spaces are Over-Lit	NO.		Investigation looked for, but did not find this issue.	
	f.2 (24)	Pump Discharge Throttled	NO.		Investigation looked for, but did not find this issue.	
	f.3 (25)	Over-Pumping	NO.		Investigation looked for, but did not find this issue.	
	f.4 (26)	Equipment is oversized for load.	NO.		Investigation looked for, but did not find this issue.	
	f.5 (27)	OTHER_Equipment Efficiency/Load Reduction	NO.		Investigation looked for, but did not find this issue.	
	g.1 (28)	VFD Retrofit - Fans	NO.		Investigation looked for, but did not find this issue.	

PBEEEP State Government

Rev. 2.0 (12/16/2010)

10204 - RCTC/ Stadium-Dome

This checklist is designed to be a resource and reference for Providers and PBEEEP.

Finding Category	Finding Type Number	Finding Type	Relevant Findings (if any)	Finding Location	Reason for no relevant finding	Notes
g. Variable Frequency Drives (VFD):	g.2 (29)	VFD Retrofit - Pumps	NO.		Investigation looked for, but did not find this issue.	
	g.3 (30)	VFD Retrofit - Motors (process)	NO.		Investigation looked for, but did not find this issue.	
	g.4 (31)	OTHER_VFD	NO.		Investigation looked for, but did not find this issue.	
h. Retrofits:	h.1 (32)	Retrofit - Motors	NO.		Investigation looked for, but did not find this issue.	
	h.2 (33)	Retrofit - Chillers	NO.		Investigation looked for, but did not find this issue.	
	h.3 (34)	Retrofit - Air Conditioners (Air Handling Units, Packaged Unitary Equipment)	NO.		Investigation looked for, but did not find this issue.	
	h.4 (35)	Retrofit - Boilers	NO.		Investigation looked for, but did not find this issue.	
	h.5 (36)	Retrofit - Packaged Gas fired heating	NO.		Investigation looked for, but did not find this issue.	
	h.6 (37)	Retrofit - Heat Pumps	NO.		Investigation looked for, but did not find this issue.	
	h.7 (38)	Retrofit - Equipment (custom)	NO.		Investigation looked for, but did not find this issue.	
	h.8 (39)	Retrofit - Pumping distribution method	NO.		Investigation looked for, but did not find this issue.	
	h.9 (40)	Retrofit - Energy/Heat Recovery	NO.		Investigation looked for, but did not find this issue.	
	h.10 (41)	Retrofit - System (custom)	NO.		Investigation looked for, but did not find this issue.	
	h.11 (42)	Retrofit - Efficient Lighting	NO.		Investigation looked for, but did not find this issue.	
	h.12 (43)	Retrofit - Building Envelope	NO.		Investigation looked for, but did not find this issue.	
	h.13 (44)	Retrofit - Alternative Energy	NO.		Investigation looked for, but did not find this issue.	
	h.14 (45)	OTHER_Retrofit	NO.		Investigation looked for, but did not find this issue.	
i. Maintenance Related Problems:	i.1 (46)	Differed Maintenance from Recommended/Standard	NO.		Investigation looked for, but did not find this issue.	
	i.2 (47)	Impurity/Contamination	NO.		Investigation looked for, but did not find this issue.	
	i.3 ( )	Leaky/Stuck Damper	NO.		Investigation looked for, but did not find this issue.	
	i.4 ( )	Leaky/Stuck Valve	NO.		Investigation looked for, but did not find this issue.	
	i.5 (48)	OTHER_Maintenance	NO.		Investigation looked for, but did not find this issue.	
j. OTHER	j.1 (49)	OTHER	NO.		Investigation looked for, but did not find this issue.	

PBEEEP
State Government

Public Buildings Enhanced Energy Efficiency Program

SCREENING RESULTS FOR ROCHESTER COMMUNITY AND TECHNICAL COLLEGE

Minnesota
STATE COLLEGES
& UNIVERSITIES

Rochester
COMMUNITY AND TECHNICAL
College

March 19, 2010

Summary Table

Rochester Community and Technical College	
Location	Main Campus, Sports Center, and Stadium: 851 30th Ave SE Rochester, MN 55904 Heintz Center: 1926 College View Road SE Rochester, MN 55904
Facility Manager	Marilyn Hansmann, Vice President Roman Staloch, Building Maintenance Foreman
Number of Buildings	32 including four main building groups
Interior Square Footage	827,878
PBEEEP Provider	Center for Energy and Environment
Date Visited	1/25/2010 and 2/23/2010
State Project Manager	Marilyn Hansmann
Annual Energy Cost	$951,386 (from 2008 utility data)
Utility Company	Rochester Public Utilities (electricity and natural gas), Olmsted County Waste-to-Energy Facility (steam)
Site Energy Use Index (EUI)	101 kBtu/sq. ft. (all buildings except Stadium) 100 kBtu/sq.ft. (Main Campus and Sports Center) 101 kBtu/sq.ft. (Heintz Center) 132 kBtu/sq.ft. (Child Care Center)
Benchmark EUI (from B3)	171 kBtu/sq.ft.

Recommendation:

A detailed investigation of the energy usage and energy savings opportunities of the twenty-one buildings listed below totaling 809,542 interior square feet at Rochester Community and Technical College (RCTC) is recommended at this time. Investigation of eleven smaller buildings totaling 18,336 square feet is not recommended.

Building Name	State ID	Building Group	Area (Square Feet)	Year Built
Art Hall	E26148C0972	Main Campus	9,586	1972
Atrium	E26148C1593	Main Campus	33,564	1993
Coffman Center	E26148C0268	Main Campus	18,686	1968
College Center	E26148C0872	Main Campus	42,620	1972
East Hall	E26148C1386	Main Campus	33,857	1986
Endicott (Humanities) Hall	E26148C0368	Main Campus	19,279	1968
Goddard Library Hall	E26148C0168	Main Campus	38,487	1968
Health Science Hall	E26148C0570	Main Campus	41,481	2007
Hill Theater	E26148C1174	Main Campus	19,267	1974
Memorial Hall	E26148C0670	Main Campus	18,768	1970

Plaza Hall	E26148C0772	Main Campus	15,012	1972
Science/Technology Hall	E26148C1693	Main Campus	58,004	1993
Singley Hall	E26148C0468	Main Campus	21,097	1968
Student Services	E26148C1073	Main Campus	45,430	1973
Sports Center	E26275T1202	Sports	115,220	2002
Heintz Center Main Bldg*	E26275T0169	Heintz	79,104	1968
Heintz Center 76 Rem/Add*	E26275T0276	Heintz	14,000	1976
Heintz Center Phase 1 Add**	E26275T0886	Heintz	70,000	1986
Heintz Center Horticulture***	E26275T1302	Heintz	19,800	2002
Heintz Center Diesel Truck*	E26275T0379	Heintz	8,280	1979
Stadium/Dome	E26275T1402	Stadium	88,000	2009

*These buildings are attached and are also known as Heintz Center A and B (HA/HB)

**This building is also known as Heintz Center C (HC)

***This building is also known as Heintz Center H (HH)

Rochester Community and Technical College Screening Overview

The goal of screening is to identify buildings where an in-depth energy investigation can be performed to identify energy saving opportunities that will generate savings with a relatively fast (1 to 5 years) and certain payback. The screening of Rochester Community and Technical College (RCTC) was performed by the Center for Energy and Environment (CEE) with the assistance of the facility staff. A walk-through was conducted on January 25, 2010 and interviews with the facility staff were carried out to fully explore the status of the energy consuming equipment and its potential for recommissioning. This report is the result of that information.

The site is divided into four groups of buildings:

- The Main Campus is comprised of fourteen attached buildings and four detached buildings totaling 422,938 interior square feet. Many of the buildings are served by the chilled water plant and steam boiler plant located in Science and Technology Hall. However, six of the Main Campus buildings have electric heat and three have DX cooling.
- The Heintz Center is comprised of five attached buildings that are divided into three wings (A, B, and C) and seven detached buildings totaling 201,720 interior square feet. The Heintz Center has its own chilled water plant and multiple DX units for cooling. The buildings use steam that is purchased from the Olmsted County Waste-to-Energy Facility.
- The Sports Center is a stand-alone detached building totaling 115,220 interior square feet. It has its own chilled water and hot water plant, although plans are in place to use steam from the waste-to-energy facility instead of the boilers. A steam-to-hot water converter would be installed so that the buildings would continue to be heated with hot water. It is served by the Main Campus electric meter.
- The Stadium is a stand-alone detached building totaling 88,000 interior square feet. It is heated by direct-fire gas burners that bring in 100% outside air.

There are two automation systems (Barber-Colman and Honeywell) that control eighteen of the buildings. The table below shows the building groups served by each building automation system (BAS).

Building Group	Barber-Colman	Honeywell
Main Campus*	X (7 Buildings)	X (9 Buildings)
Heintz Center		X
Sports Center		X
Stadium		

*Two buildings are served by both automation systems.

The seven buildings currently controlled by the Barber-Colman system are in the process of being added to the Honeywell system so that all eighteen buildings will be controlled by the Honeywell BAS. The facility staff anticipate that it will be a few years before all of the buildings are on the Honeywell system. Points on the Barber-Colman BAS cannot be trended, so stand-alone loggers will need to be used to gather data on the equipment controlled by the Barber-Colman BAS. The Honeywell system is model EBI R310.1. The staff believes that the system is capable of trending all points and exporting the data in a format that can be used for spreadsheet analysis, but this has not been verified. The equipment in all of the buildings is controlled electronically, but some equipment in the Main Campus buildings and Heintz Center are actuated pneumatically. The remaining buildings not on the automation system are maintenance buildings, storage buildings and the Child Care Center.

The buildings were all constructed between 1968 and 2009. There have been major renovations to the mechanical systems since the buildings were constructed and there have also been major use changes within the buildings.

Reasons for Recommendations

There are many factors that are part of the decision; at RCTC the following characteristics were important in the building selection process:

- Large square footage
- Connected to the building automation system
- Persistent energy-related problems reported by facility staff
- Energy intensive in nature (e.g., dome covering athletic field in winter)
- Occupancy schedules vary throughout the different buildings
- The staff and management are supportive of these efforts

The buildings are divided into two categories: those that are recommended for energy investigation; and those that were poor candidates for investigation.

Recommended for Investigation:

Twenty one buildings totaling 809,542 square feet are good candidates for investigation. Each of these buildings has a moderate floor area, at least one central air handling unit, and is controlled by a building automation system. The screening information was collected from the site visits, interviews with facility staff, and mechanical prints.

Main Campus Building Group (14 buildings):

Art Hall			**State ID # E26148C0972**		
Area (sqft)	9,586	Year Built	1972	Occupancy (hrs/yr)	4,800

HVAC Equipment

- **2 AHUs**

Name	**Type**	**Size**	**Notes**
AS1	CAV	5 hp SF	Chilled water and electric heat
AS2	CAV	3 hp SF	Chilled water and electric heat

Points on BAS

- **AHU Points** (Honeywell): SF and RF Status, Preheat valve, MA and OA damper position, MAT, Face/Bypass damper position, Reheat valve, DAT, RAT, Room temp, Econ enable setpoint, Cooling enable setpoint, Unocc cooling setpoint, Unocc heating setpoint, Small kiln exhaust, Large kiln exhaust, Paint exhaust, Total OA required

Atrium			**State ID # E26148C1593**		
Area (sqft)	33,564	Year Built	1993	Occupancy (hrs/yr)	4,800

HVAC Equipment

- **2 AHUs**

Name	**Type**	**Size**	**Notes**
AHU 7	VAV	13,305 cfm	Chilled water and steam
AHU 8	VAV	15,925 cfm	Chilled water and steam

- **24 VAV boxes with hot water reheat**
- **2 CRAC units in server room**

Points on BAS

- **Server Room Points** (Honeywell): Zone temps and Zone humidity
- **AHU Points** (Barber-Colman): RA RH, RAT, EA/RA/OA damper position, RF speed, RF status, MAT, OAT, Filter, HV, CV, SF speed, SF status, DAT, DA RH, Humidity Valve, Duct Static
- **VAV Points** (Barber-Colman): DAT from AHU, Damper position, HW valve, Velocity pressure, Actual flow, Flow setpoint

Coffman Center			State ID # E26148C0268		
Area (sqft)	18,686	Year Built	1968	Occupancy (hrs/yr)	4,800

HVAC Equipment

- **2 AHUs**

Name	Type	Size	Notes
AHU A1	CAV	7.5 hp SF, 5 hp RF	Chilled water and electric heat, Face/Bypass
"Tunnel AHU"	CAV		DX cooling and electric heat. Not on either BAS.

- **1 Chiller**

Name	Type	Size	Notes
N/A	Trane, centrifugal	200 Tons	Local control

- **1 DX unit**

Name	Type	Size	Notes
N/A	McQuay	20 Ton	Serves "Tunnel AHU"

Points on BAS

- **AHU Points** (Barber-Colman): SF and RF Status, EA/RA/OA Damper position, MAT, Face/Bypass Damper Position, HV, CV, DAT, RAT
- **Chiller Points** (Barber-Colman): CDWRT, CDWST, CHWRT, CHWST, Condenser water pump status

College Center			State ID # E26148C0872		
Area (sqft)	42,620	Year Built	1972	Occupancy (hrs/yr)	4,800

HVAC Equipment

- **5 AHUs**

Name	Type	Size	Notes
CS1	CAV	5 hp SF, 1 hp RF	Chilled water and electric heat
CS3	CAV	5 hp SF	Chilled water and electric heat
CS4	CAV	3 hp SF, no RF	Chilled water and electric heat
CS5	CAV	7.5 hp SF, 5 hp RF	Chilled water and electric heat
CS6	CAV	7.5 hp SF, 5 hp RF	Chilled water and electric heat

- **1 Chiller**

Name	Type	Size	Notes
N/A	Carrier, centrifugal	200 Ton	Local control, 2 CHW pumps

- **1 Cooling tower**

Points on BAS

- **Chiller Points** (Honeywell): Chiller OA enable setpoint, CHWRT, CHWST, Pump status, Chiller status
- **AHU Points** (Honeywell): RAT, RF and SF status, MA and OA damper position, MAT, Face/Bypass Damper, Cooling valve, DAT, Zone Temp, DAT reset, Econ OAT enable setpoint, Cooling enable setpoint, Unocc cooling setpoint, Unocc heating setpoint

East Hall		State ID # E26148C1386			
Area (sqft)	33,857	Year Built	1986	Occupancy (hrs/yr)	4,800

HVAC Equipment

- **1 AHU**

Name	Type	Size	Notes
AHU 1	Multizone, VAV	30 hp SF, 25 hp RF	Two zones, VFD on SF only, chilled water and electric heat

- **1 Chiller**

Name	Type	Size	Notes
N/A	McQuay	93 Ton	Air-cooled, 4 compressors, DDC control

Points on BAS

- **Pump Points** (Honeywell): Pump status, Lead select, CHWST, CHWRT
- **AHU Points** (Honeywell): RAT, MA and OA Damper positions, MAT, Cooling valve, SF VFD, RF and SF status, Heat (stage 1 vs stage 2), DAT, Zone dampers, Zone duct static pressures, Econ OAT enable setpoint, Cooling enable setpoint

Endicott Hall		State ID # E26148C0368			
Area (sqft)	19,279	Year Built	1968	Occupancy (hrs/yr)	4,800

HVAC Equipment

- **1 AHU**

Name	Type	Size	Notes
AHU H1	CAV	10 hp SF, 5 hp RF	Chilled water and 6-stage electric heat

Points on BAS

- **AHU Points** (Barber-Colman): SF and RF Status, EA/RA/OA Damper position, MAT, Face/Bypass Damper Position, Heating coil stage heat (6 stages), CV, DAT, RAT

Goddard Library Hall		State ID # E26148C0168			
Area (sqft)	38,487	Year Built	1968	Occupancy (hrs/yr)	4,800

HVAC Equipment

- **2 AHUs**

Name	Type	Size	Notes
AHU L1	VAV	20 hp SF, 5 hp RF	VFD on SF, Inlet Vanes on RF, chilled water and steam
AHU L2	VAV	20 hp SF, 5 hp RF	VFD on SF, Inlet Vanes on RF, chilled water and steam

Points on BAS

- **AHU Points** (Barber-Colman): SF and RF status, SF and RF speed, RA RH, RAT, EA/RA/OA damper position, MAT, HV, CV, DA RH, DAT, Duct static pressure

Health Science Hall			State ID # E26148C0570		
Area (sqft)	41,481	Year Built	2007	Occupancy (hrs/yr)	4,800

HVAC Equipment

- **2 AHUs**

Name	Type	Size	Notes
AHU 1	VAV	Unknown	VFDs on SF and RF, Face/Bypass, chilled water and steam
AHU 2	VAV	Unknown	VFDs on SF and RF, Face/Bypass, chilled water and steam

- **29 VAV boxes**
- **4 Cabinet Unit Heaters**
- **4 Exhaust Fans**
- **2 Fan Coil Units**

Points on BAS

- **AHU Points** (Honeywell): RA RH, RAT, RA CFM, RF status, RF speed, EA and RA damper position, OA damper position, OA CFM, MAT, Face/Bypass damper position, Steam valve, Heating DAT, Chilled water coil, SF status, SF speed, DA RH, DAT, Duct static pressure, Econ OAT enable, Max VAV damper position
- **VAV Points** (Honeywell): Room temp
- **Exhaust Fan Points** (Honeywell): Fan status
- **Fan Coil Unit Points** (Honeywell): HV, Zone temp

Hill Theater			State ID # E26148C1174		
Area (sqft)	19,267	Year Built	1974	Occupancy (hrs/yr)	4,800

HVAC Equipment

- **3 AHUs**

Name	Type	Size	Notes
A1	CAV	10,800 cfm and 10 hp SF, 10,260 cfm and 5 hp RF	DX cooling and steam
A2	CAV	10,700 cfm and 15 hp SF, no RF	DX cooling and steam
A4	CAV	4,000 cfm and 3 hp SF, no RF	DX cooling and steam

- **3 DX units**

Name	Type	Size	Notes
N/A	Carrier	45 Tons total	2 compressors

- **4 Fan Coil Units in Bookstore**

Points on BAS

- **AHU Points** (Honeywell): RAT, RF status (A1 only), RA and OA damper positions, MAT, Cooling valve, SF status, Hot water valve (A1 only), DAT, Room temp, Econ OAT enable, Unocc cooling setpoint, Unocc heating setpoint

Comments

- The theater is used for public performances several times a year at times when it would otherwise be unoccupied.

Memorial Hall			State ID # E26148C0670		
Area (sqft)	18,768	Year Built	1970	Occupancy (hrs/yr)	4,800

HVAC Equipment

- **2 AHUs**

Name	Type	Size	Notes
S1	CAV	5 hp SF, no RF	Chilled water and electric heat
S2	CAV	3 hp SF, no RF	Chilled water and electric heat

- **50 PTACs (quantity is approximate) serve the third and fourth floor offices**

Points on BAS

- **AHU Points** (Honeywell): RAT, RF status (S1A only), RA/OA damper position, MAT, Face/Bypass damper position, Cooling valve, SF status, DAT, Zone temp, Econ OAT enable, Unocc cooling setpoint, Unocc heating setpoint, DAT reset

Plaza Hall			State ID # E26148C0772		
Area (sqft)	15,012	Year Built	1972	Occupancy (hrs/yr)	4,800

HVAC Equipment

- **1 AHU**

Name	Type	Size	Notes
S1A	CAV	5 hp SF, 3 hp RF	Chilled water and electric heat

- **50 PTACs (quantity is approximate) serve the third and fourth floor offices**

Points on BAS

- **AHU Points** (Honeywell): RAT, RF status (S1A only), RA/OA damper position, MAT, Face/Bypass damper position, CV, SF status, DAT, Zone temp, Econ OAT enable, Unocc cooling setpoint, Unocc heating setpoint, DAT reset

Science/Technology Hall			State ID # E26148C1693		
Area (sqft)	58,004	Year Built	1993	Occupancy (hrs/yr)	4,800

HVAC Equipment

- **7 AHUs**

Name	Type	Size	Notes
AHU 1	CAV	2,725 cfm and 3 hp SF	Face/Bypass, RF not used, chilled water and steam
AHU 2	CAV	5 hp SF	Chilled water and steam
AHU 3	VAV	7.5 hp SF, 7.5 hp RF	Inlet vanes on SF and RF, chilled water and steam
AHU 4	VAV	5 hp SF, 7.5 hp RF	Inlet vanes on SF and RF, chilled water and steam
AHU 5	VAV	15 hp SF, 10 hp RF	VFDs on SF and RF, chilled water and steam
AHU 6	VAV	25 hp SF, 25 hp RF	VFDs on SF and RF, Face/Bypass, Heat Wheel, chilled water and steam
Wood Shop AHU	CAV	Unknown	Chilled water and steam

- **3 Chillers**

Name	Type	Size	Notes
N/A	York, screw	200 Tons	
N/A	York, screw	200 Tons	
N/A	York, screw	107 Tons	

- **3 cooling towers, two of which are 212 tons**

- **Economizer Coil Heat Exchanger (not in use)**

- **3 Steam Boilers**

Name	Type	Size	Notes
N/A	Cleaver Brooks, fire tube	4,184 kBtu/hr	Natural gas and fuel oil, 11lb steam
N/A	Cleaver Brooks, fire tube	4,184 kBtu/hr	Natural gas and fuel oil, 11 lb steam
N/A	Cleaver Brooks, fire tube	1,255 kBtu/hr	Natural gas and fuel oil, 11 lb steam

- **12 Cabinet Unit Heaters**

- **Steam to Hot Water Converter**

Points on BAS

- **Chiller Points** (Barber-Colman for Chillers 1 and 2): Cooling tower status, Cooling tower fan speed (CT-2), Tower bypass valve, Condenser water pump status, CDWST, CDWRT, CHWST, CHWRT, Chilled water pump status
- **Chiller Points** (Honeywell for Chiller 3): Cooling tower status, Cooling tower fan speed (CT-2), Tower bypass valve, Condenser water pump status, CDWST, CDWRT, CHWST, CHWRT, Chilled water pump status
- **Hot Water Converter Points** (Honeywell): Steam pressure, Entering steam temp, Leaving hot water temp, Pump status, Pump speed
- **AHU Points** (Honeywell): RF status (AHU-1, 3, 4, 5), SF status, RF and SF speed (AHU-5,6), RA RH, EA/RA/OA damper position, Filter, Face/Bypass damper position (AHU-1,6), HV, CV, DAT, DA RH, Humidity valve, Heat wheel command (AHU-6)

Singley Hall			**State ID # E26148C0468**		
Area (sqft)	21,097	Year Built	1968	Occupancy (hrs/yr)	4,800

HVAC Equipment

- **1 AHU**

Name	**Type**	**Size**	**Notes**
AHU 12	VAV	18,250 cfm and 15 hp SF, 7.5 hp RF	VFDs on SF and RF, chilled water and steam

- **21 VAV boxes**

Points on BAS

- **AHU Points** (Barber-Colman): RF and SF speed, RF and SF status, RA RH, RAT, EA/RA/OA damper position, Filter, HV, CV, DAT, DA RH, Duct static pressure
- **VAV Points** (Barber-Colman): DAT from AHU, Damper position, Fan status, Velocity pressure, Actual flow, Space temp

Student Services			**State ID # E26148C1073**		
Area (sqft)	45,430	Year Built	1973	Occupancy (hrs/yr)	4,800

HVAC Equipment

- **3 AHUs**

Name	**Type**	**Size**	**Notes**
AHU 9	VAV	13,850 cfm	VFDs on SF and RF, chilled water and steam
AHU 10	VAV	11,500 cfm	VFDs on SF and RF, chilled water and steam
AHU 11	VAV	12,600 cfm	VFDs on SF and RF, chilled water and steam

Points on BAS

- **AHU Points** (Barber-Colman): RF and SF speed, RF and SF status, RA RH, RAT, EA/RA/OA damper position, Filter, HV, CV, DAT, DA RH, Duct static pressure
- **VAV Points** (Barber-Colman): DAT from AHU, Damper position, Fan status, Velocity pressure, Actual flow, Space temp, Occ, HV (on some)

Heintz Center Building Group (5 buildings):

Heintz Center (HA/HB) **State ID # E26275T0169,**
Heintz Center 76 **E26275T0276,**
Heintz Center Diesel **E26275T0379**

Area (sqft)	101,384	Year Built	1968-1979	Occupancy (hrs/yr)	4,800

HVAC Equipment

- **3 AHUs**

Name	Type	Size	Notes
AHU 9A	VAV	Unknown	VFDs on SF and RF, chilled and hot water
AHU 9B	VAV	Unknown	VFDs on SF and RF, chilled and hot water
AHU 15	VAV	Unknown	VFDs on SF and RF, chilled and hot water

- **9 RTUs**

Name	Type	Size	Notes
RTU 1	CAV	8,000 cfm and 7.5 hp	2-stage 25 Ton DX
RTU 2	CAV	9,000 cfm and 7.5 hp	2-stage 25 Ton DX
RTU 3	CAV	8,000 cfm and 7.5 hp	2-stage 25 Ton DX
RTU 4	CAV	7,600 cfm and 7.5 hp	2-stage 25 Ton DX
RTU 5	VAV	10,000 cfm	VFDs on SF and RF, 2-stage 30 Ton DX
RTU 6	CAV	12,000 cfm and 10 hp	2-stage 44 Ton DX
RTU 8	CAV	7.5 hp	
RTU 13	CAV	7,000 cfm and 5 hp	
RTU 14	CAV	4,000 cfm and 5 hp	

- **16 VAV boxes (quantity is approximate)**
- **7 Exhaust Fans (quantity is approximate)**
- **1 Fan Coil Unit**

Points on BAS

- **AHU Points** (Honeywell): RAT, EA CFM, RF speed, EA/RA/OA damper positions, OA CFM, MAT, Heating valve, Cooling valve, SF speed, DAT, Duct static pressure
- **RTU Points** (Honeywell): RAT, RF status (RTU-5), RF speed (RTU-5), RA/OA damper positions, MAT, Heating valve (RTU-5), Cooling stage (1 or 2), SF status, SF speed (RTU-5), DAT, Duct static pressure (RTU-5)
- **VAV Points** (Honeywell): Room temps
- **Exhaust Fan Points** (Honeywell): Fan status, EA CFM (Kitchen EF)
- **Fan Coil Unit Points** (Honeywell): OA and RA Damper position, Heating valve, Fan status, DAT, Zone Temp

Heintz Center C-wing (HC)			State ID # E26275T0886		
Area (sqft)	70,000	Year Built	1986	Occupancy (hrs/yr)	4,800

HVAC Equipment

- **2 AHUs**

Name	Type	Size	Notes
AHU 1	VAV	17,500 cfm and 20 hp SF, 7.5 hp RF	VFDs on SF and RF, hot water and 2-stage 52 Ton DX
AHU 2	VAV	17,500 cfm and 15 hp SF, 7.5 hp RF	VFDs on SF and RF, hot water and 2-stage 52 Ton DX

- **1 Chiller**

Name	Type	Size	Notes
N/A	Unknown	70 Tons	

- **1 Hot Water Boiler**

Name	Type	Size	Notes
N/A	Bryan, flexible tube	4,500 kBtu/hr	Natural gas

- **1 Steam Boilers**

Name	Type	Size	Notes
N/A	Kewanee, fire tube	840 kBtu/hr	120 lb steam, used for training purposes only- steam is not used.
N/A	Cleaver Brooks, fire tube	3,360 kBtu/hr	Not in use

Points on BAS

- **AHU Points** (Honeywell): RAT, RA RH, RA CFM, RF speed, EA/RA/OA damper position, MAT, Heating valve, Cooling stage (1 or 2), SF speed, SA CFM, DAT, Duct static pressure
- **Chiller Points** (Honeywell): Pump speed, CHWST, CHWRT, Chiller status, Bypass valve, CHW differential pressure

Heintz Center Horticulture (HH)			State ID # E26275T1302		
Area (sqft)	19,800	Year Built	2002	Occupancy (hrs/yr)	4,800

HVAC Equipment

- **1 AHU**

Name	Type	Size	Notes
"Hort AHU"	CAV	5 hp SF, 3 hp RF	

- **1 RTU**

Name	Type	Size	Notes
RTU 10	CAV	3,600 cfm and 5 hp SF	

Points on BAS

- None currently, although Honeywell is in the process of moving equipment to the new system.

Comments

- This building contains a greenhouse.

Sports Center Building Group (1 building):

Sports Center			State ID # E26275T1202		
Area (sqft)	115,220	Year Built	2002	Occupancy (hrs/yr)	4,800

HVAC Equipment

- **8 AHUs**

Name	Type	Size	Notes
AHU 1	VAV	24,000 cfm	VFDs on SF and RF, chilled and hot water
AHU 2	VAV	24,000 cfm	VFDs on SF and RF, chilled and hot water
AHU 3	VAV	10,100 cfm	VFDs on SF and RF, chilled and hot water
AHU 4	VAV	30,000 cfm	VFDs on SF and RF, chilled and hot water
AHU 5	VAV	15,200 cfm	VFDs on SF and RF, chilled and hot water
AHU 6	VAV	13,000 cfm	VFDs on SF and RF, chilled and hot water
AHU 7	CAV	6,000 cfm	100% return air, hot water only
AHU 8	CAV	6,000 cfm	100% return air, hot water only

- **44 VAV boxes**

- **9 Exhaust Fans**

- **2 Chillers**

Name	Type	Size	Notes
N/A	Carrier, reciprocating	240 Tons	Air-cooled, 9 compressors
N/A	Carrier, reciprocating	240 Tons	Air-cooled, 9 compressors

- **2 Hot Water Boilers**

Name	Type	Size	Notes
N/A	Kewanee, fire tube	3,500 kBtu/hr	Natural gas
N/A	Kewanee, fire tube	3,500 kBtu/hr	Natural gas

Points on BAS

- **AHU Points** (Honeywell): RF status, RF speed, RAT, EA/RA/OA damper position, MA static pressure, MAT, Heating valve, Cooling valve, SF status, SF speed, DAT, Supply duct static pressure, Zone temp, Optimum start-stop enable, DAT reset, Econ OAT setpoint
- **VAV Points** (Honeywell): Room temp
- **Exhaust Fan Points** (Honeywell): SF status
- **Chiller Points** (Honeywell): CHWST and CHWRT (primary and secondary loop), CHW pump status (p and s), CHW pump speed, Secondary loop DP, Chiller compressor status, Chiller enable
- **Boiler Points** (Honeywell): HWST, HW pump status, HW pump speed, Boiler status, Boiler % burner, Hot water reset based on OAT
- **Lighting Points** (Honeywell): Light status

Stadium/Dome Building Group (1 building):

The stadium has a removable dome, reaching 60 feet high in the center, which allows for year-round sporting events. The dome is used only during the winter and is heated. In the spring, the dome is removed. The stadium is not air-conditioned. The stadium/dome is rented out to pay for the heating costs.

Stadium		**State ID # E26275Y1402**			
Area (sqft)	88,000	Year Built	2009	Occupancy (hrs/yr)	Varies
HVAC Equipment					
• 2 Direct Gas-fired Burners **Name** N/A **Type** CAV **Size** 500,000 MBH each **Notes** 100% outside air					
Points on BAS					
• None					

Not Recommended for Investigation:

The following detached buildings are not recommended for investigation because they have a small square footage and they are not on the building automation system. Some of the buildings are unconditioned, so they have little to no energy use.

Building Name	State ID	Area (Square Feet)	Year Built
Child Care Center	E26148C1489	4,000	1989
Maintenance Building 1	E26148C1277	1,800	1977
Maintenance Building 2	E26275T0681	1,632	1981
Storage Building 1	E26275T0479	1,000	2001
Storage Building 2	E26275T0580	1,000	2001
Storage Building 4	E26275T0782	1,000	1982
Storage Building 5	E26275T0990	1,000	1990
Storage Building 6	E26275T1094	864	1994
Storage Building 7	E26275T1195	960	1995
Storage Building 8	E26275T1700	4,080	2002
Storage Building 9	E26275T1506	1,000	2006

PBEEEP Abbreviation Descriptions	
AHU	Air Handling Unit
BAS	Building Automation System
CAV	Constant Air Volume
CDW	Condenser Water
CDWRT	Condenser Water Return Temperature
CDWST	Condenser Water Supply Temperature
CFM	Cubic Feet per Minute
CHW	Chilled Water
CHWRT	Chilled Water Return Temperature
CHWST	Chilled Water Supply Temperature
CRAC	Computer Room Air Conditioner
CV	Cooling Valve
DA	Discharge Air
DAT	Discharge Air Temperature
DDC	Direct Digital Control
DP	Differential Pressure
DX	Direct Expansion
EA	Exhaust Air
Econ	Economizer
EF	Exhaust Fan
FCU	Fan Coil Unit
HV	Heating Valve
HV/CV	Single coil valve with hot & chilled water
HW	Hot Water
MA	Mixed Air
MAT	Mixed Air Temperature
MAU	Make-up Air Unit
OA	Outside Air
OAT	Outside Air Temperature
RA	Return Air
RAT	Return Air Temperature
RF	Return Fan
RH	Relative Humidity
RTU	Rooftop Unit
SF	Supply Fan
Unocc	Unoccupied
VAV	Variable Air Volume
VFD	Variable Frequency Drive